



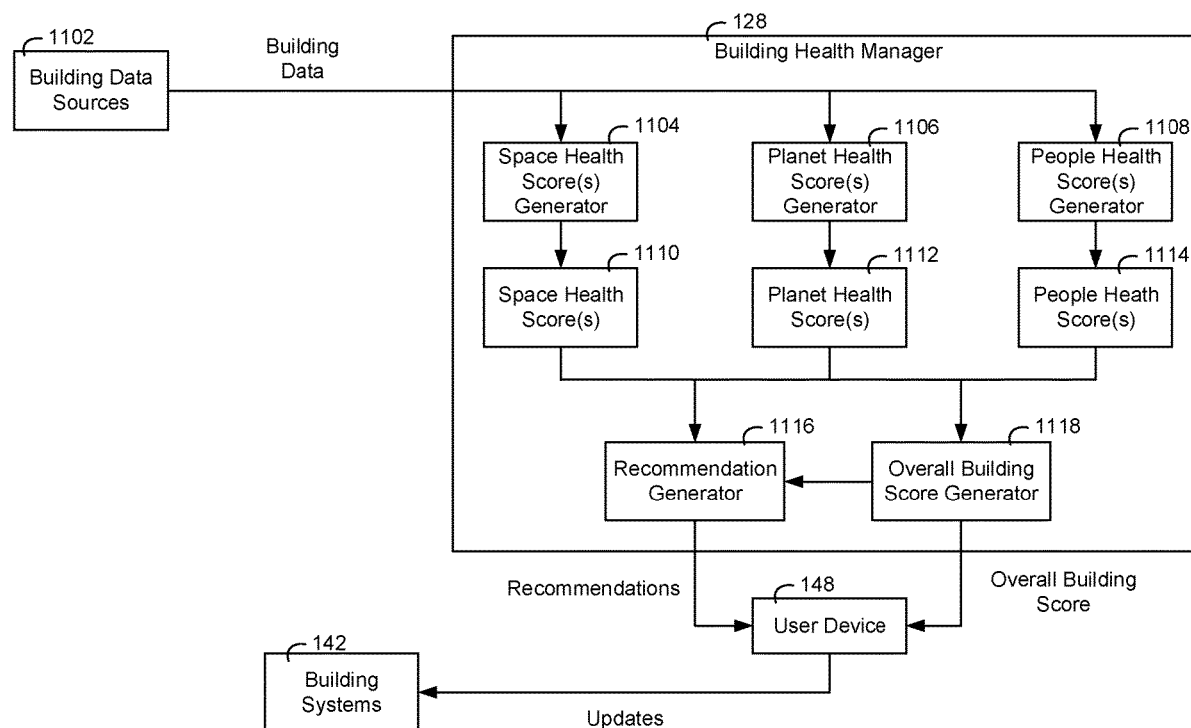
US 20220058545A1

(19) **United States**(12) **Patent Application Publication**
Warake et al.(10) **Pub. No.: US 2022/0058545 A1**(43) **Pub. Date: Feb. 24, 2022**(54) **BUILDING SYSTEM WITH BUILDING
HEALTH RECOMMENDATIONS****Publication Classification**(51) **Int. Cl.****G06Q 10/06** (2006.01)**G05B 19/418** (2006.01)(52) **U.S. Cl.****CPC ... G06Q 10/0639** (2013.01); **G05B 19/41845**(2013.01); **G05B 19/41855** (2013.01); **G06Q****10/06315** (2013.01)(71) Applicant: **Johnson Controls Tyco IP Holdings
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Stangarone**, Milwaukee, WI (US);
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(US); **Kerry M. Bell**, Mukwonago, WI
(US)(57) **ABSTRACT**(73) Assignee: **Johnson Controls Tyco IP Holdings
LLP**, Milwaukee, MI (US)(21) Appl. No.: **17/354,565**(22) Filed: **Jun. 22, 2021****Related U.S. Application Data**(60) Provisional application No. 63/113,019, filed on Nov.
12, 2020.(30) **Foreign Application Priority Data**

Aug. 18, 2020 (IN) 202021035549

Jan. 29, 2021 (IN) 202121004000

A building system of a building including one or more storage devices storing instructions thereon that, when executed by one or more processors, cause the one or more processors to generate one or more recommendations for improving one or more building scores, the one or more recommendations including a prediction of an increase to a level of the one or more building scores or a decrease to the level of the one or more building scores. The instructions cause the one or more processors to cause the display device of the user device of the user to display the one or more recommendations and receive, via the display device, a selection of one recommendation of the one or more recommendations via the display device from the user and operate the one or more building systems based on one or more operating settings of the one recommendation.



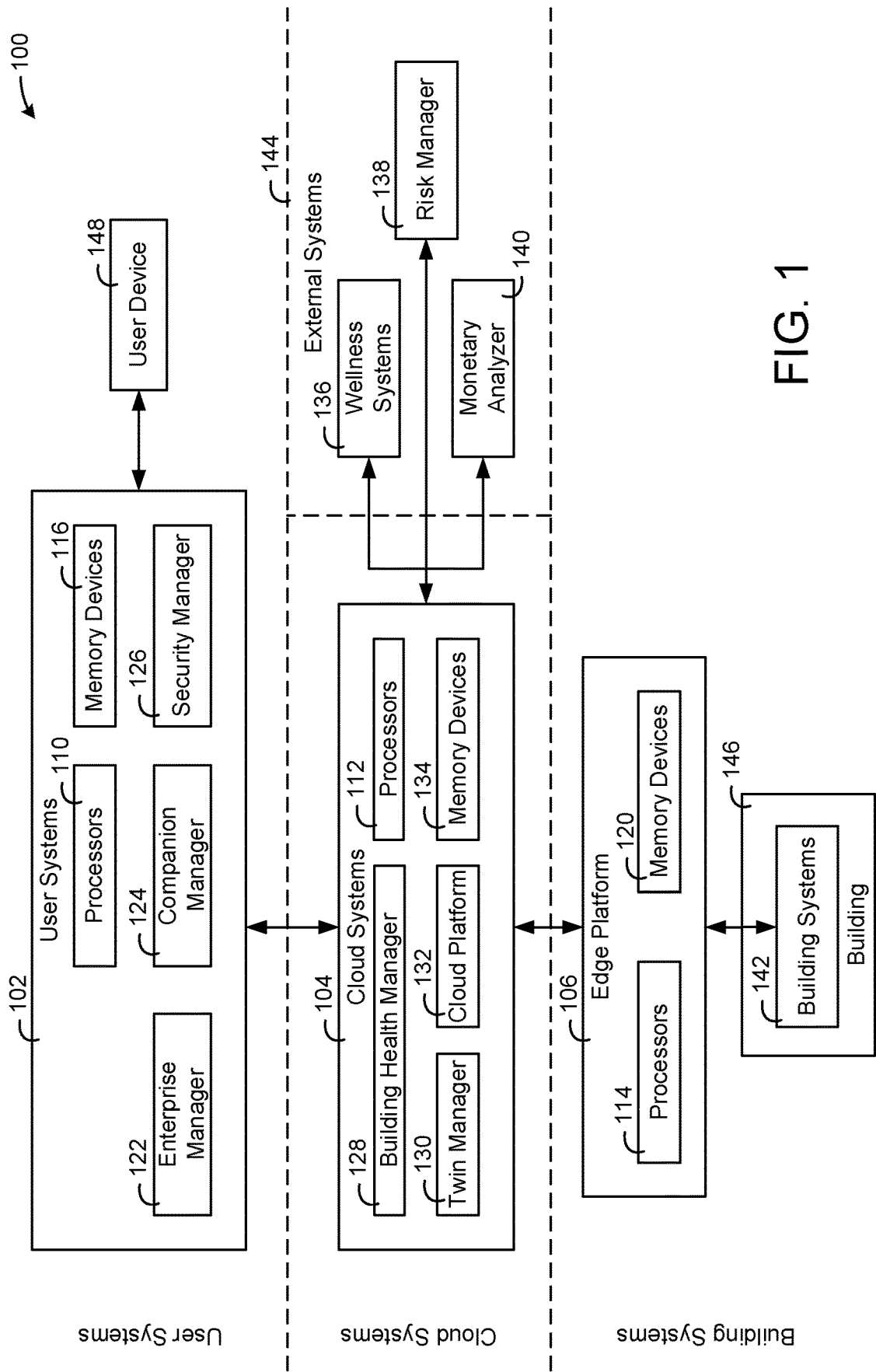


FIG. 1

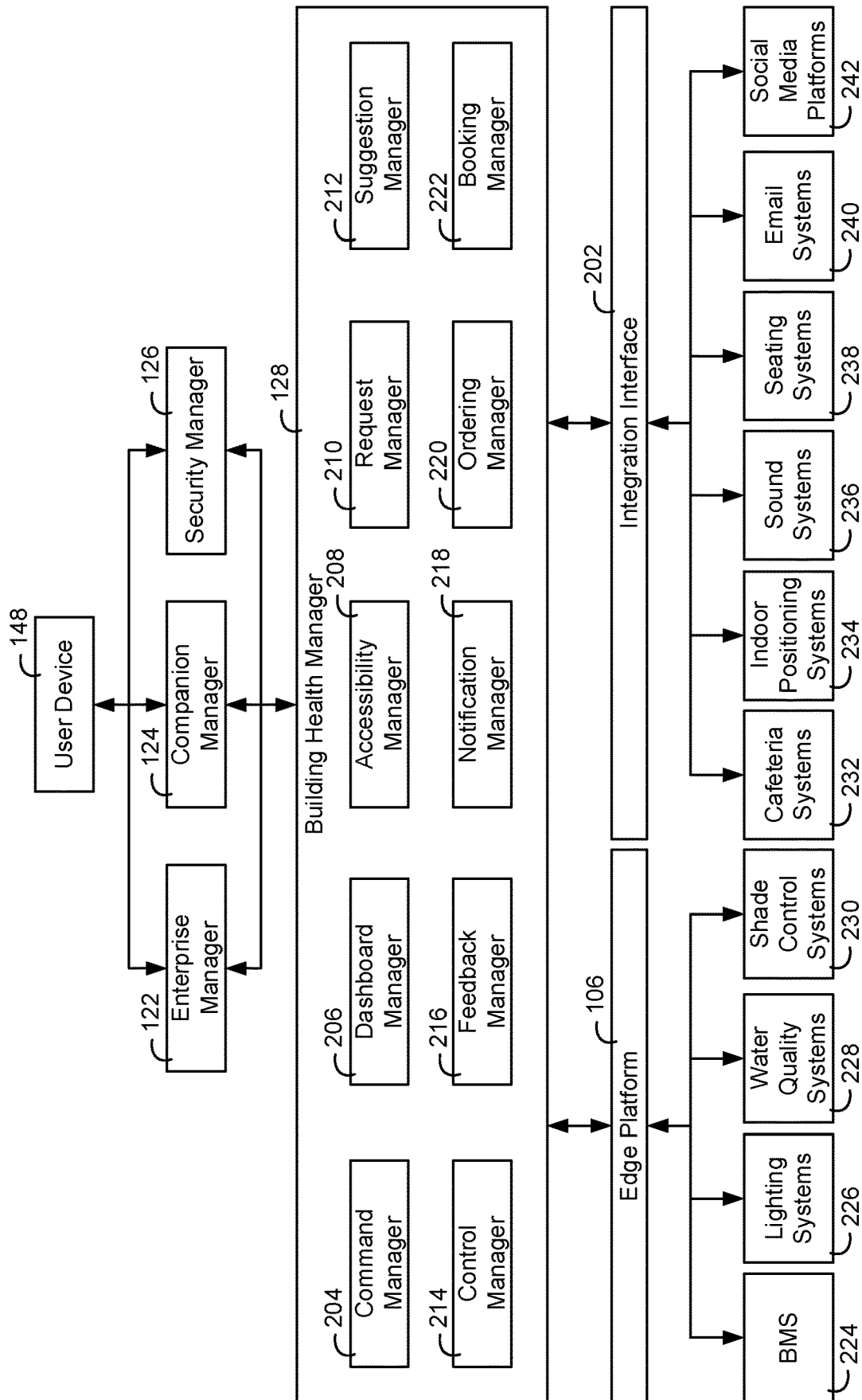


FIG. 2

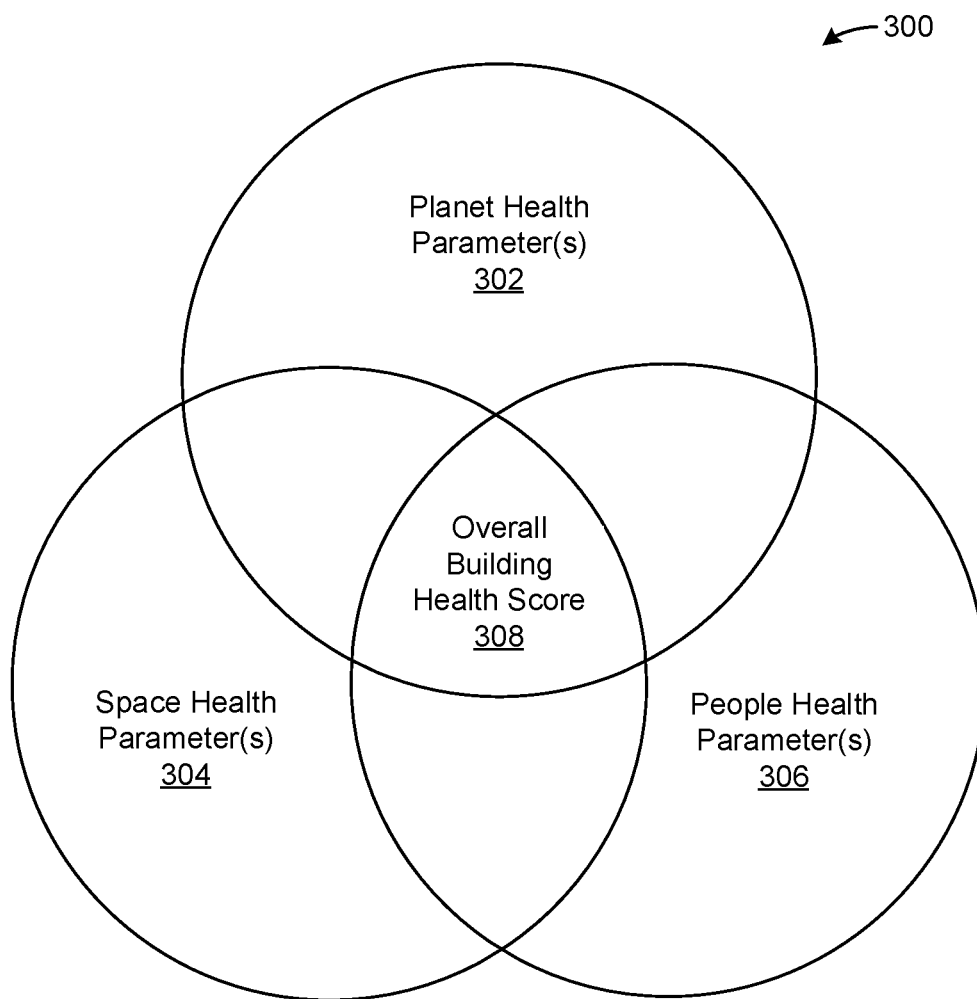


FIG. 3

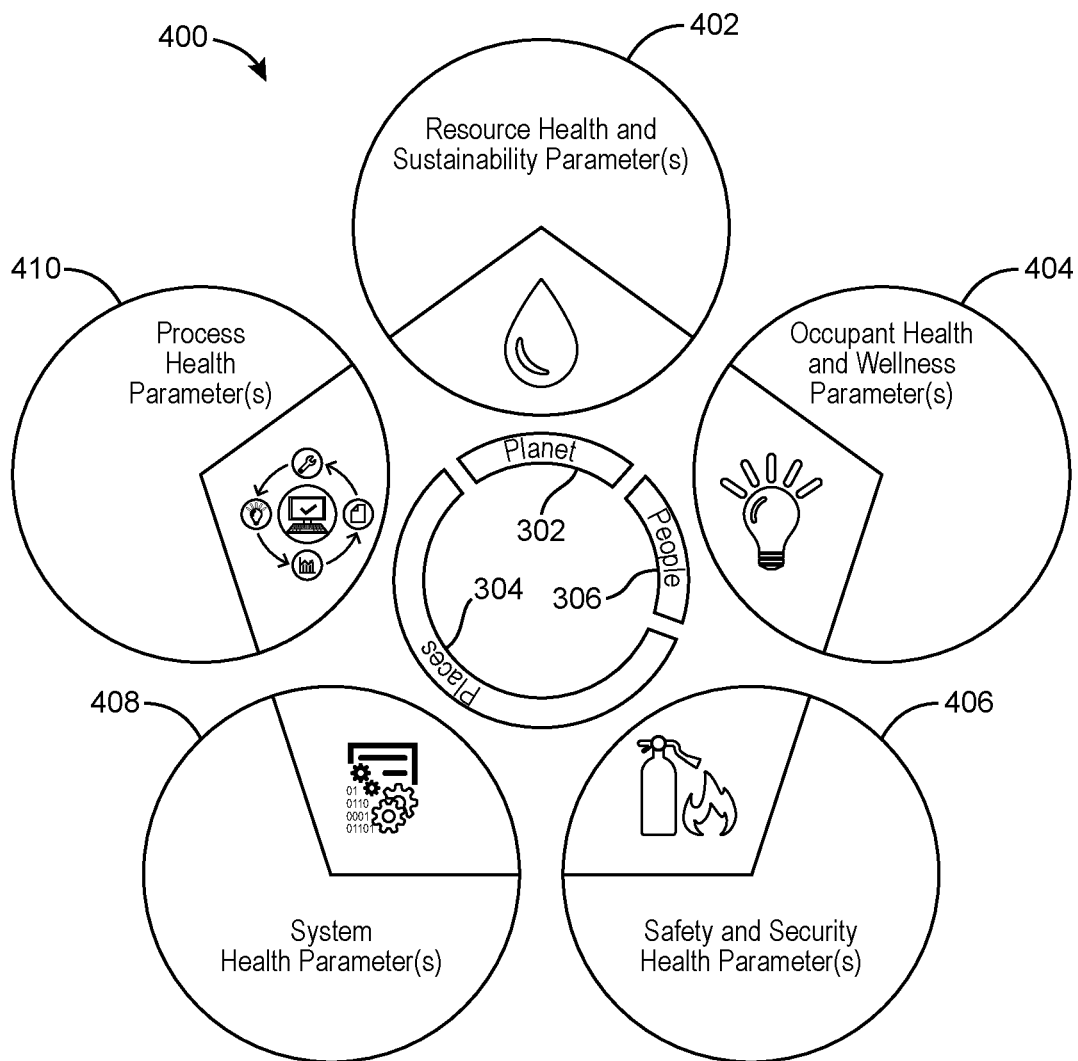


FIG. 4

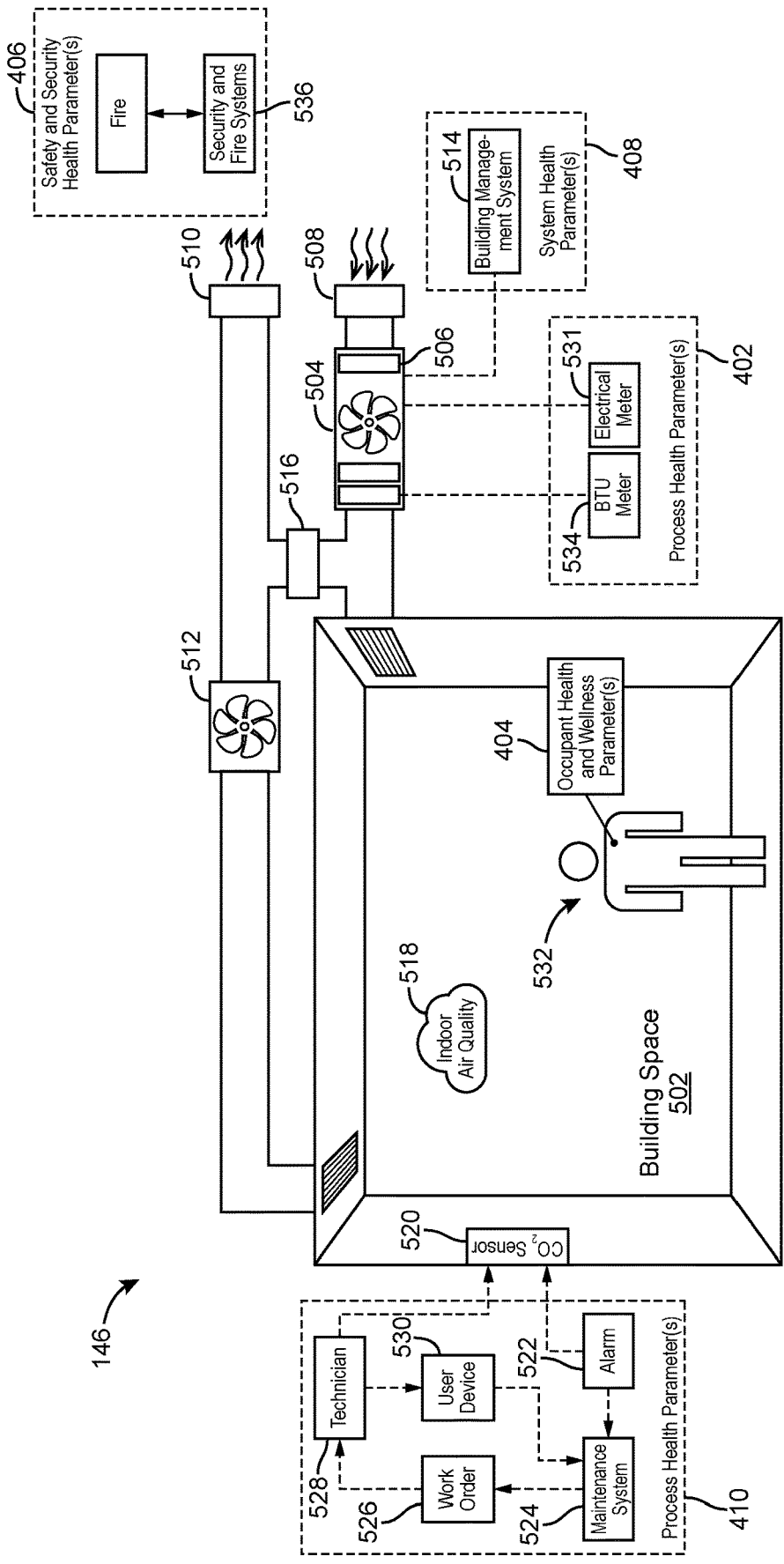


FIG. 5A

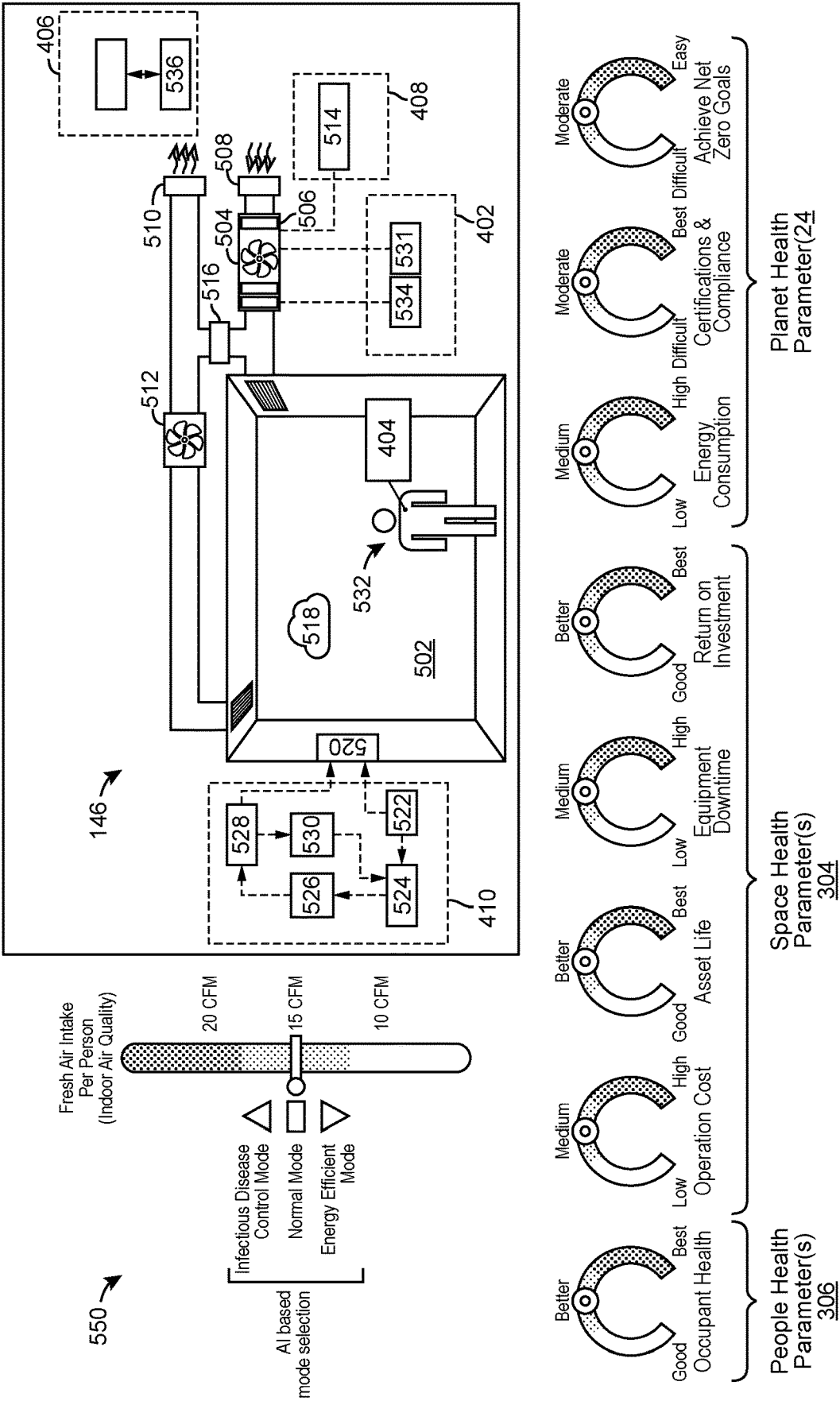


FIG. 5B

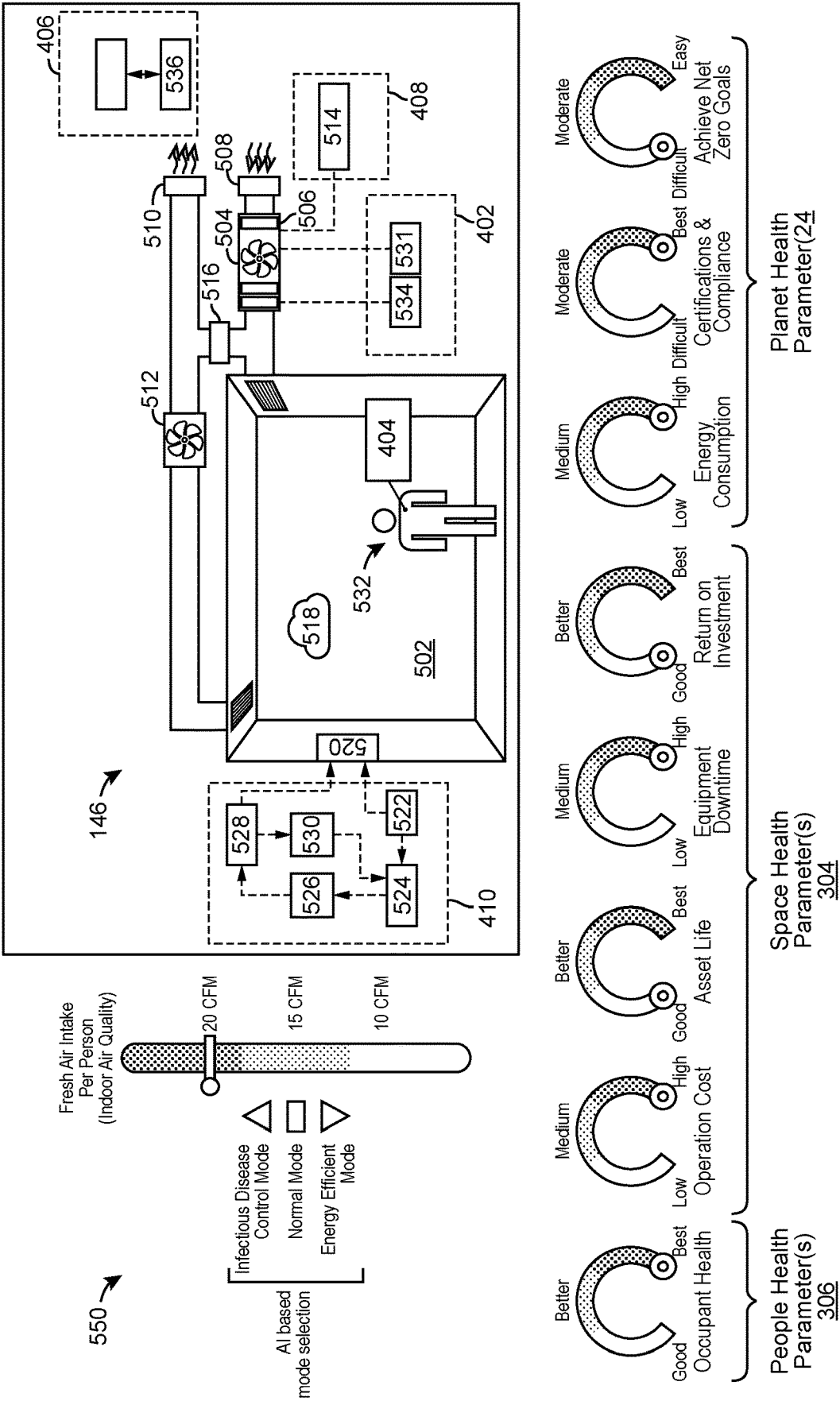


FIG. 5C

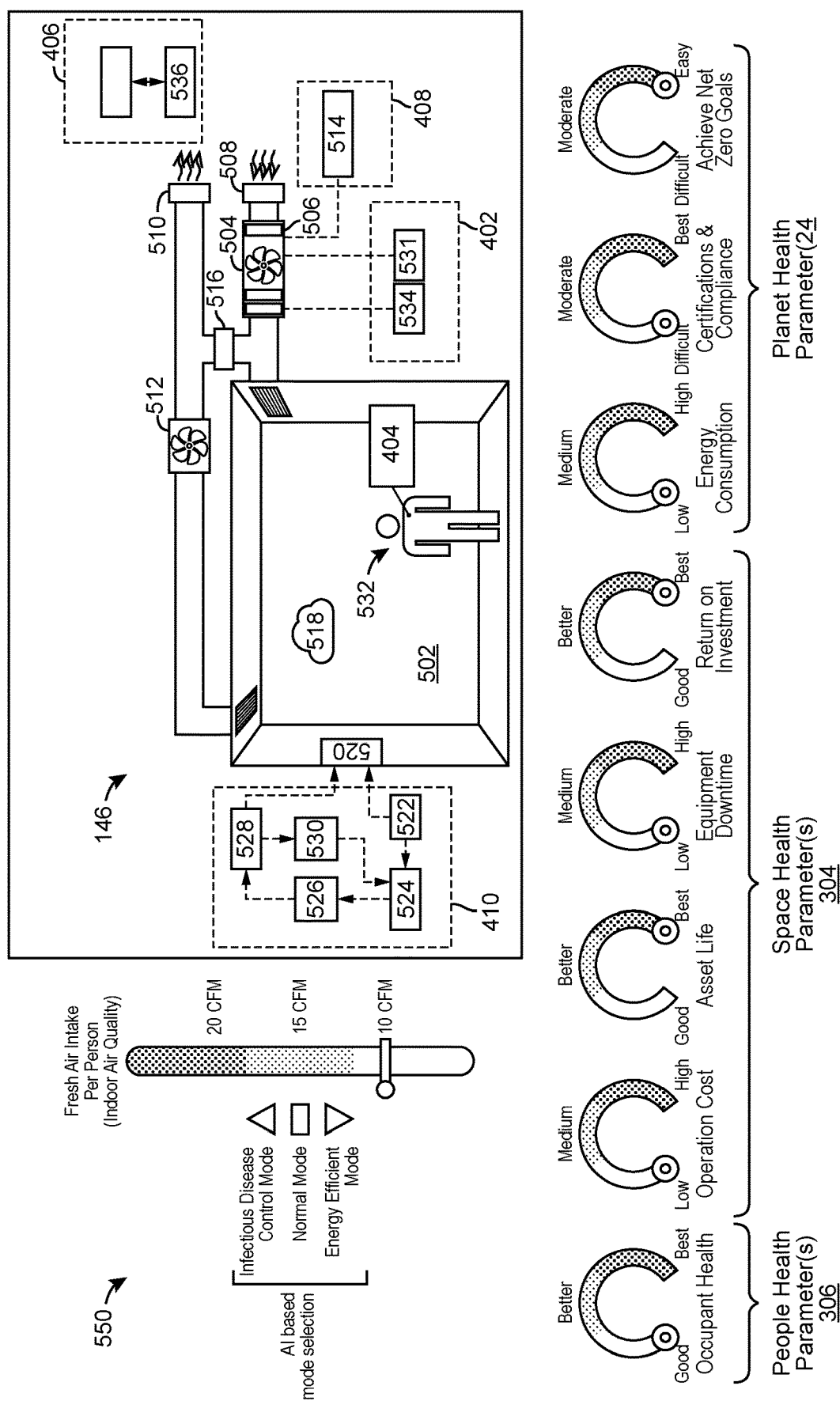


FIG. 5D

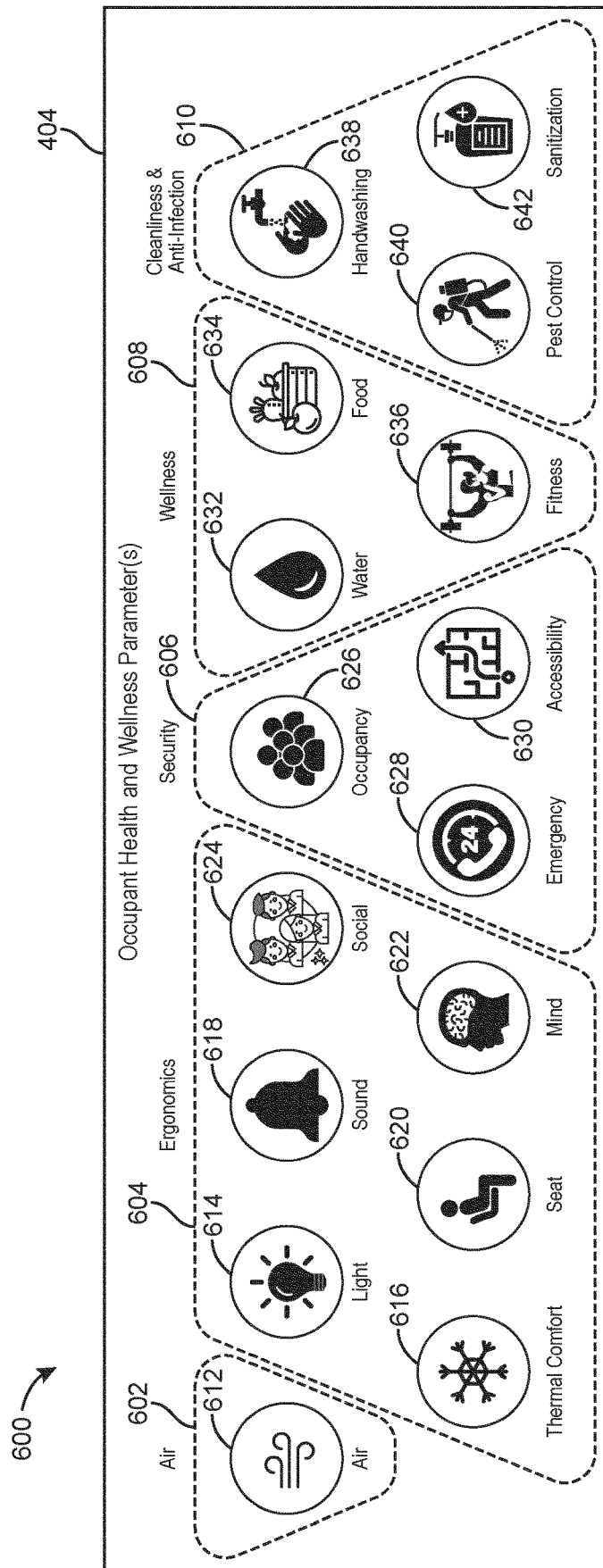


FIG. 6

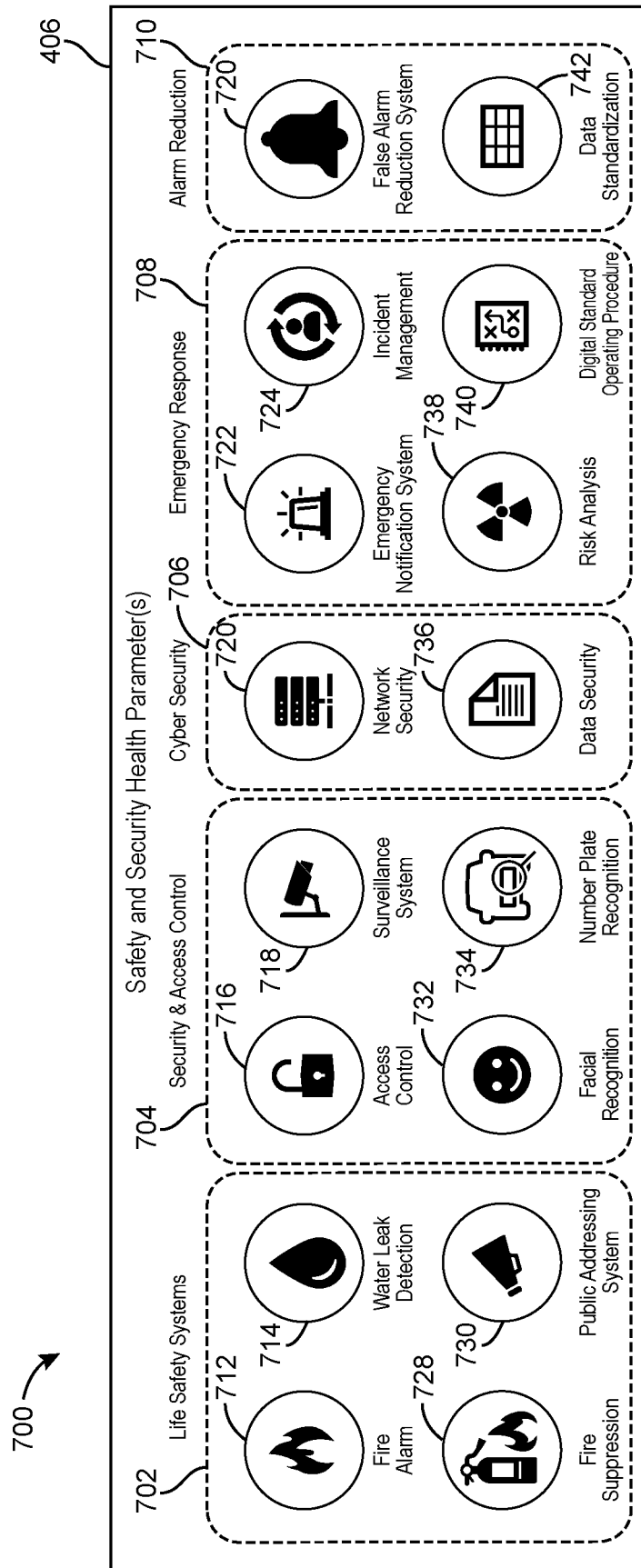


FIG. 7

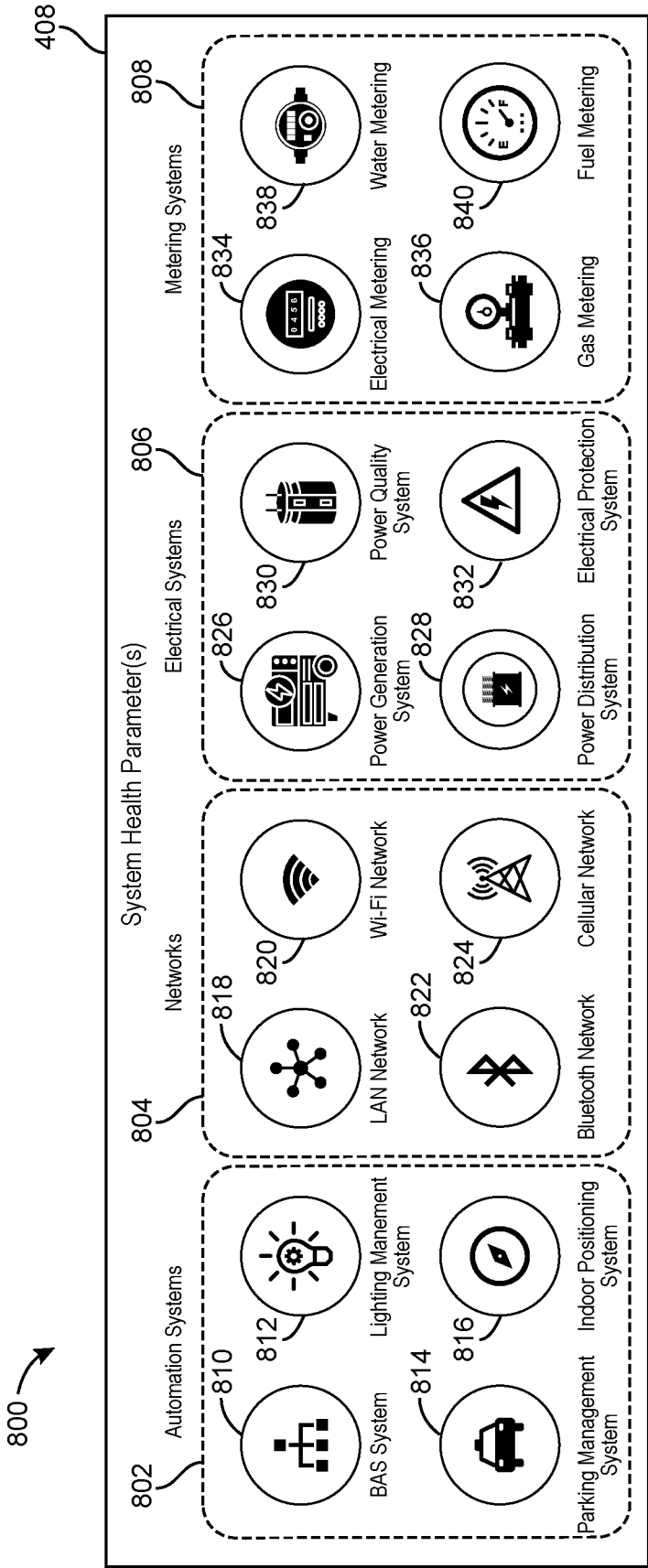


FIG. 8

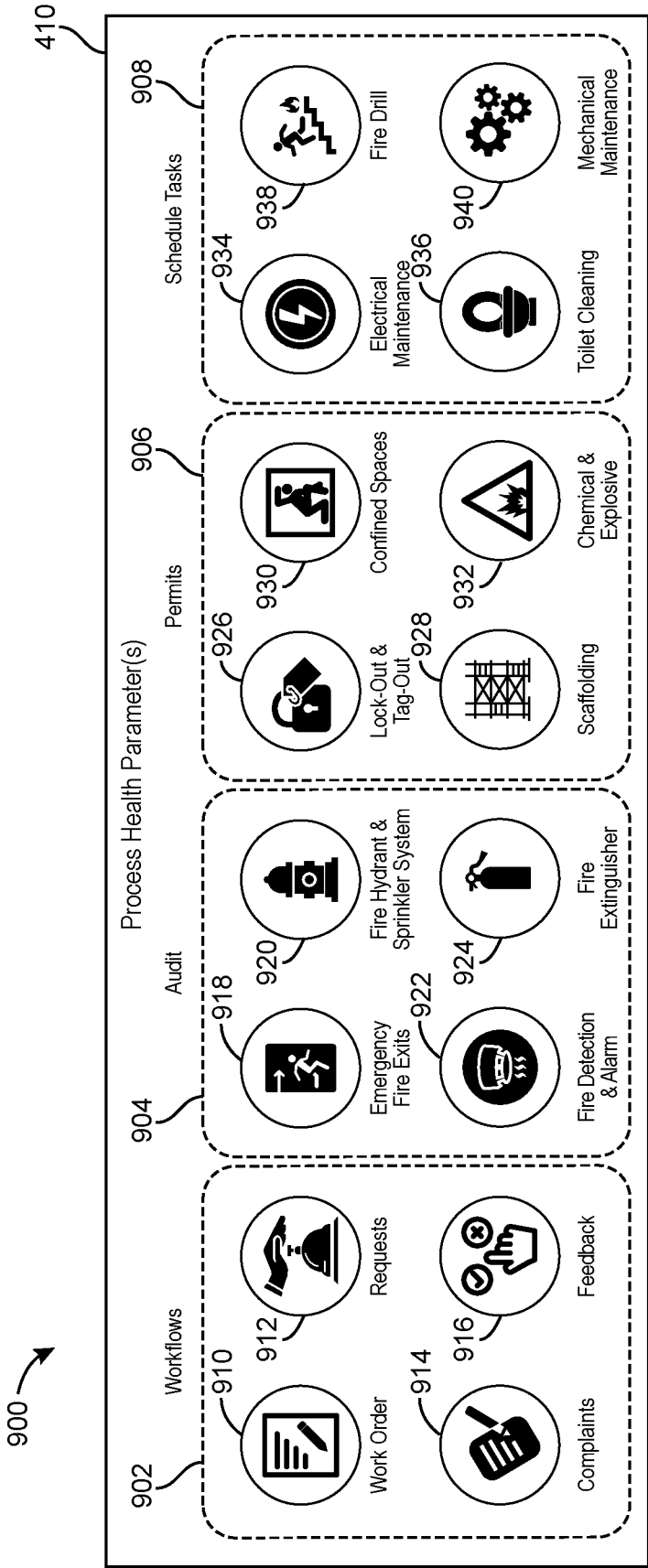


FIG. 9

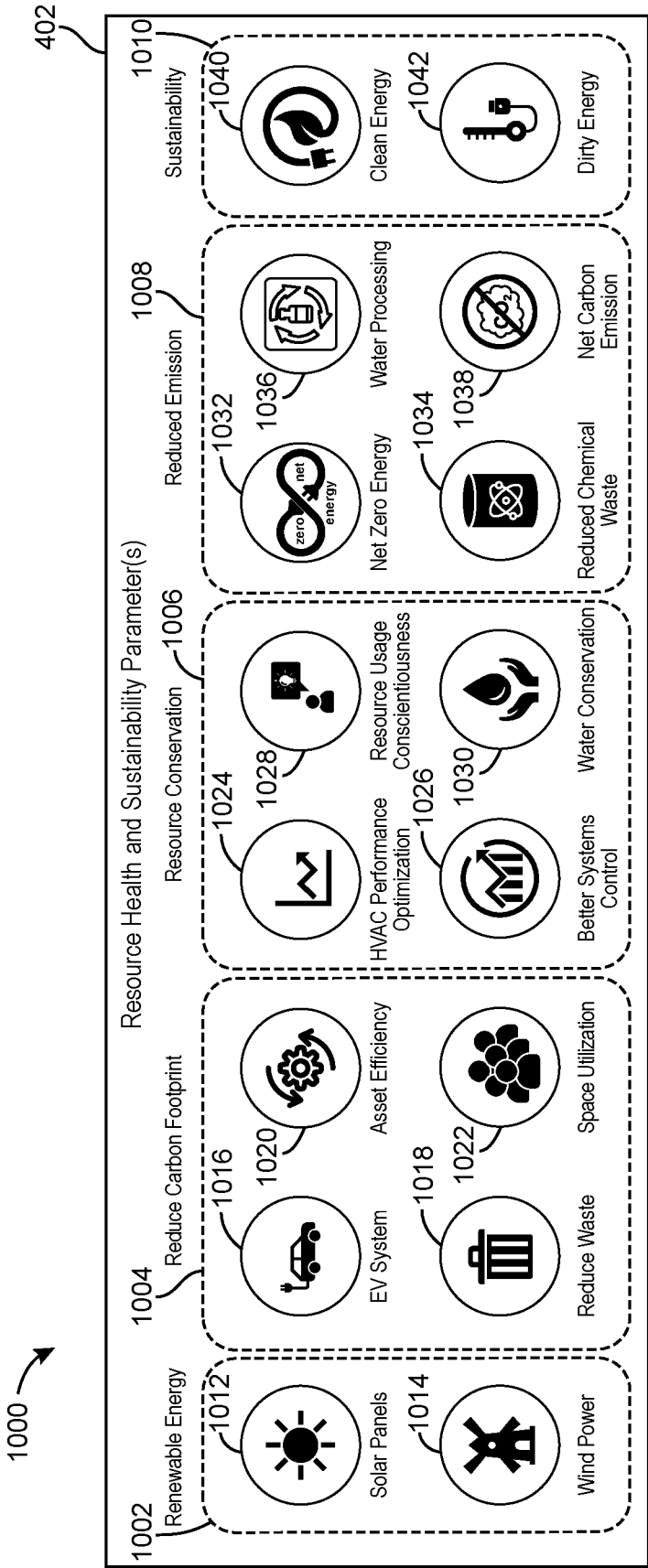


FIG. 10

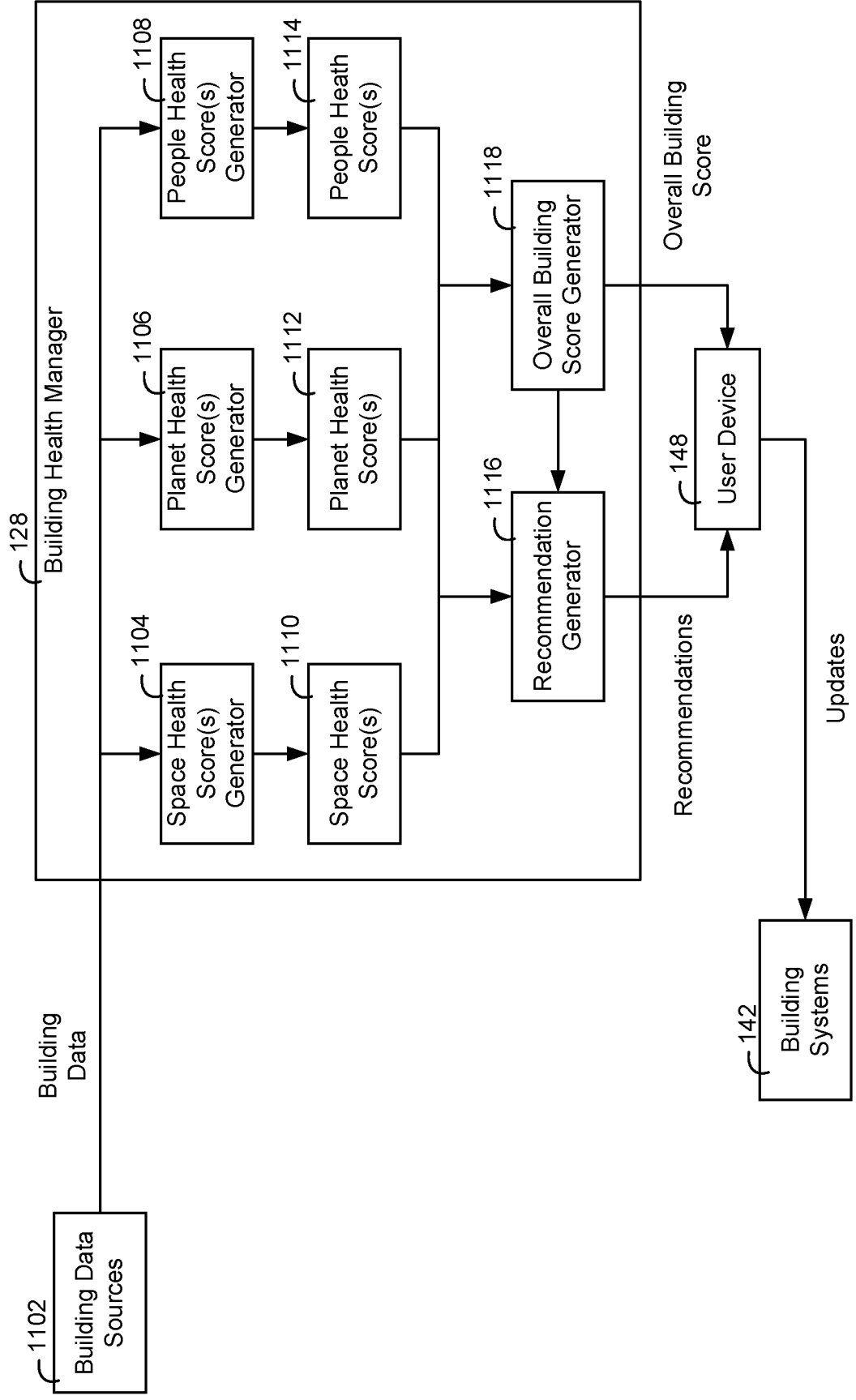


FIG. 11

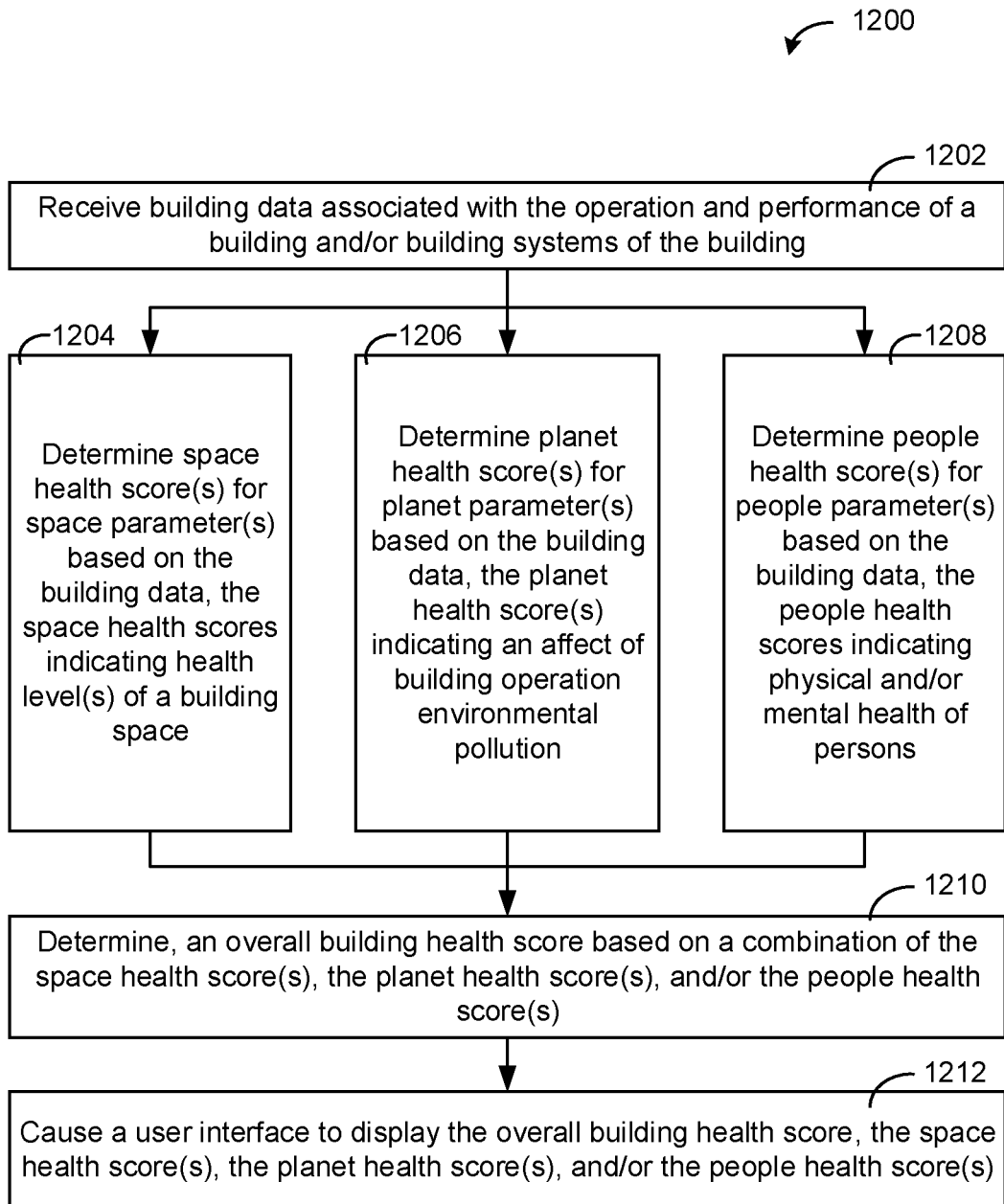


FIG. 12

1300 →

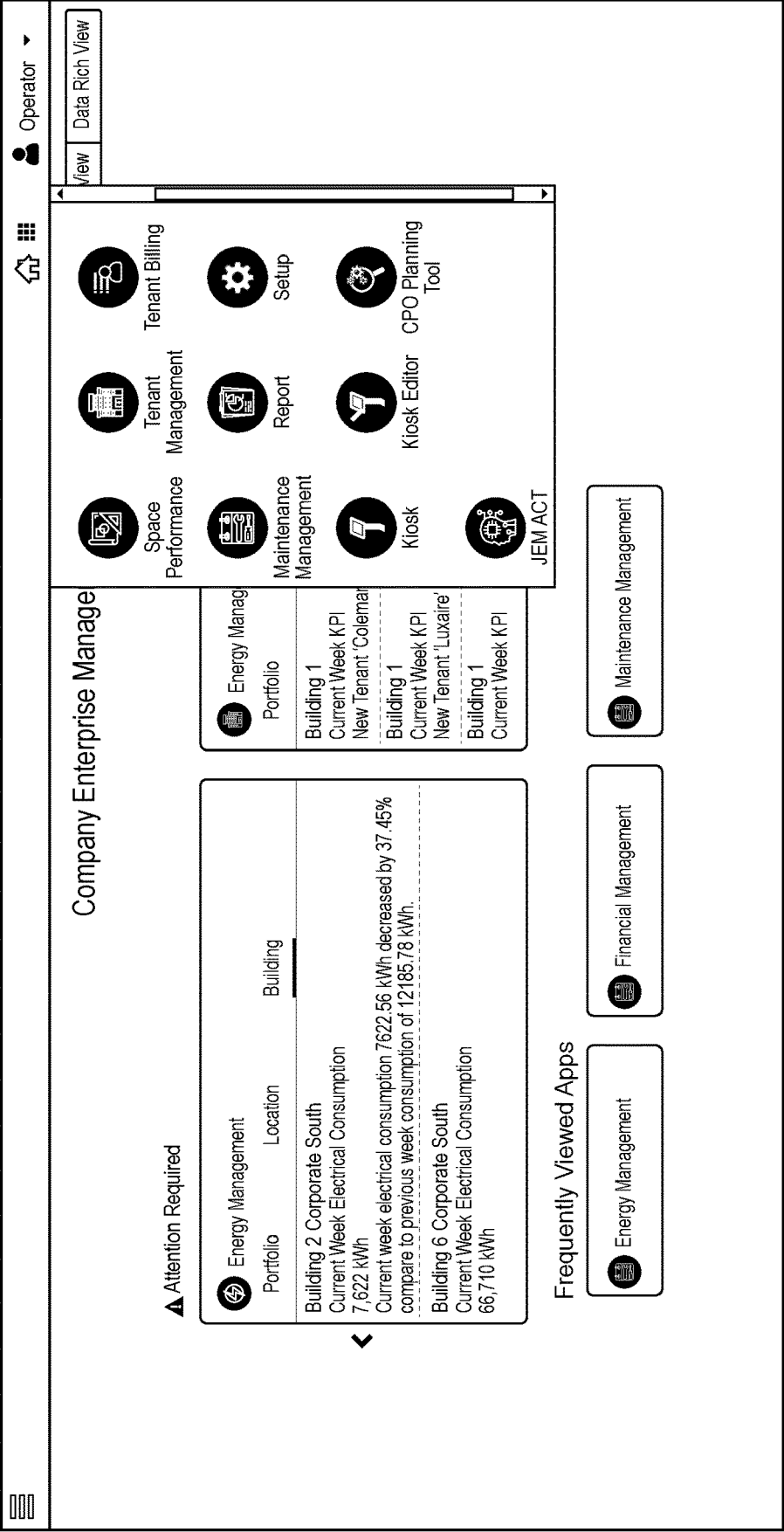


FIG. 13

1400

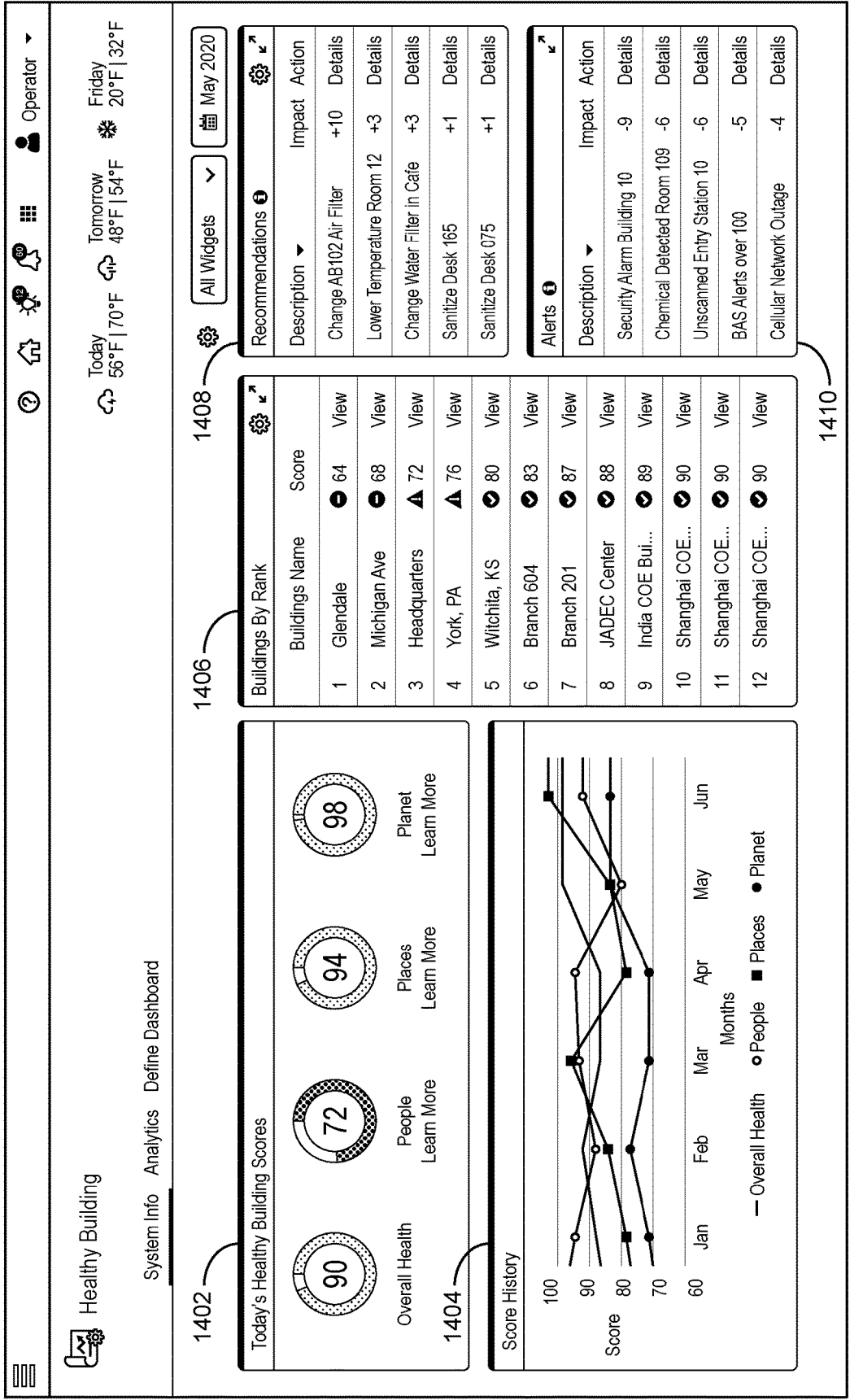


FIG. 14

1500

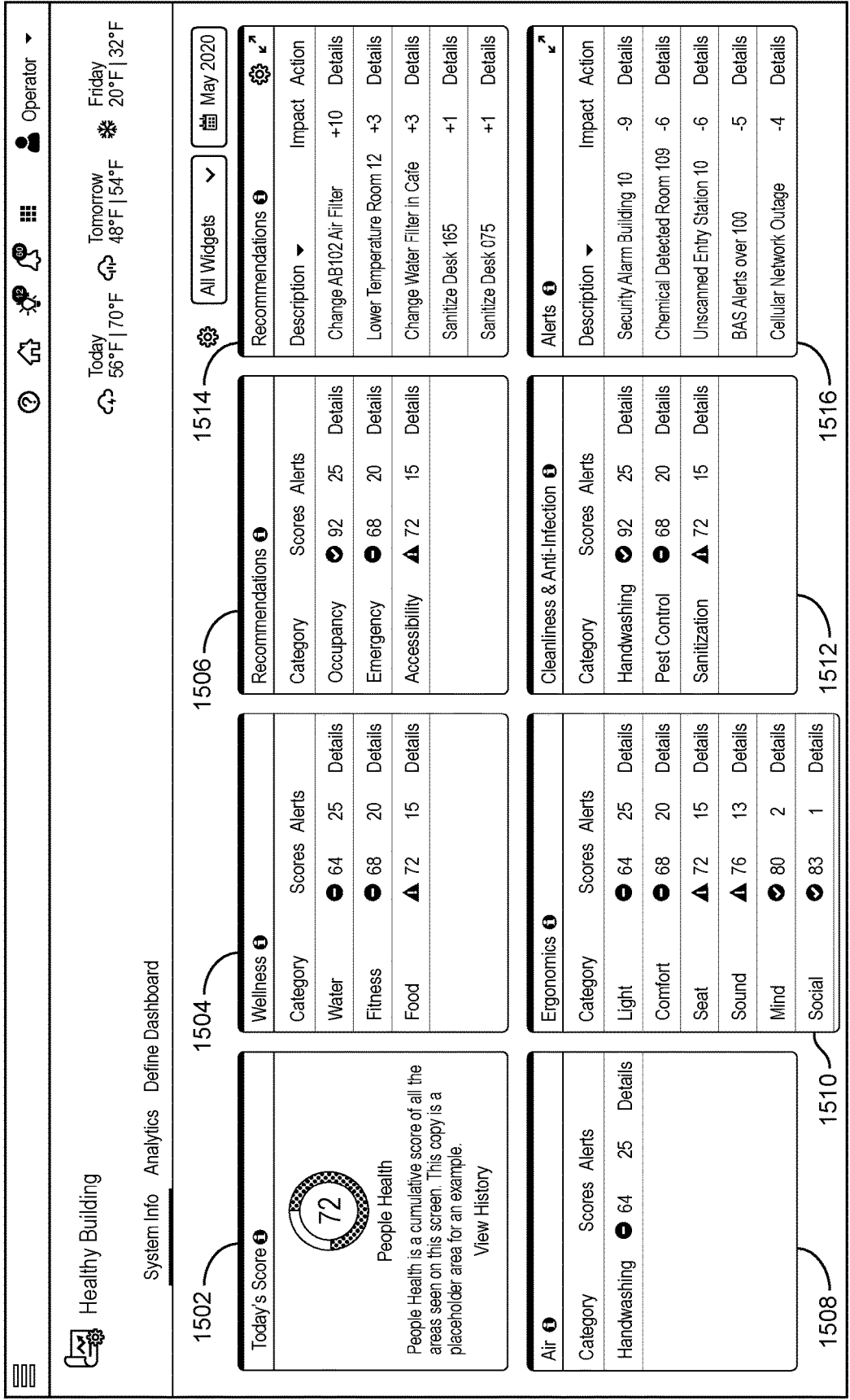


FIG. 15

1600

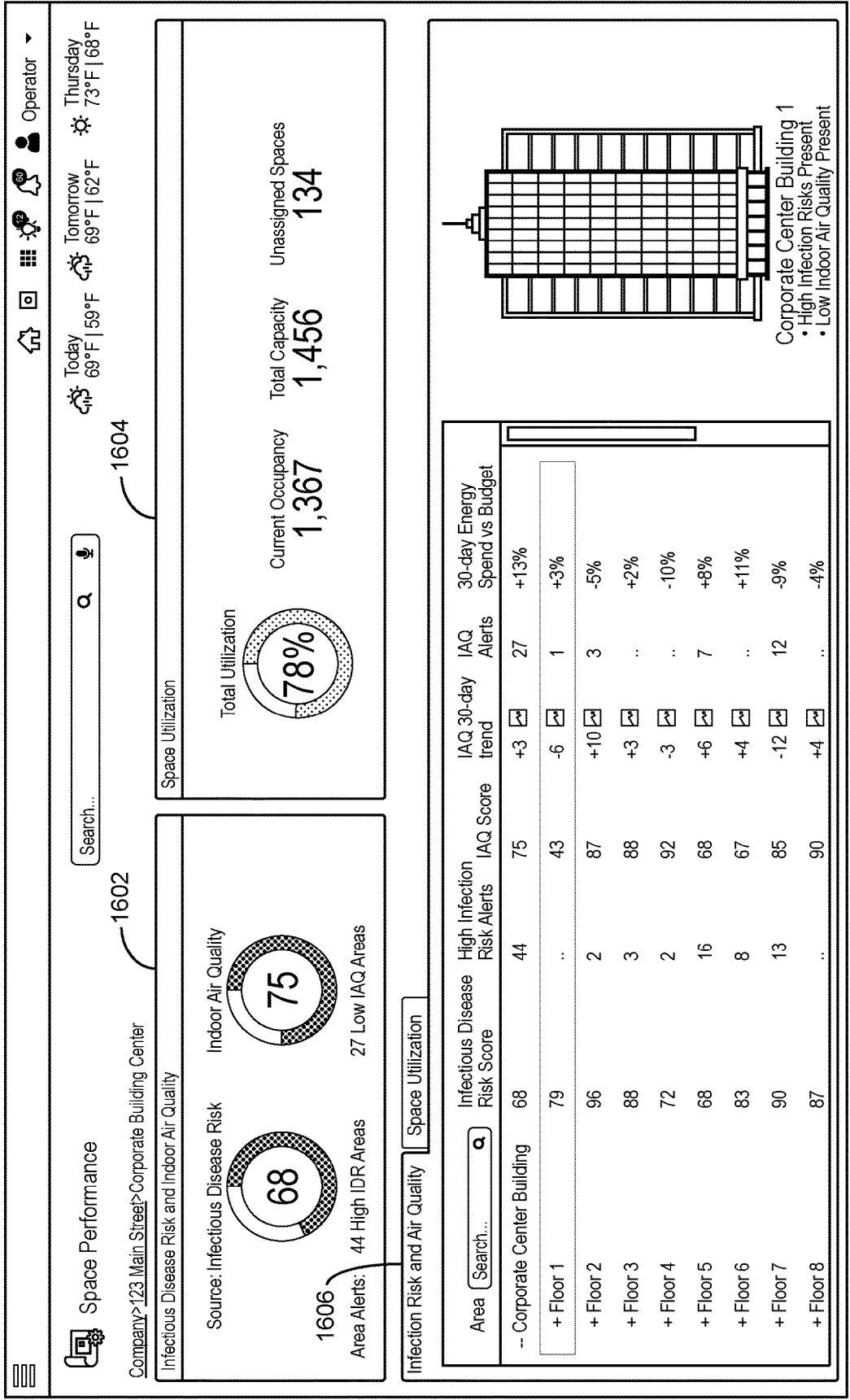


FIG. 16A

1650

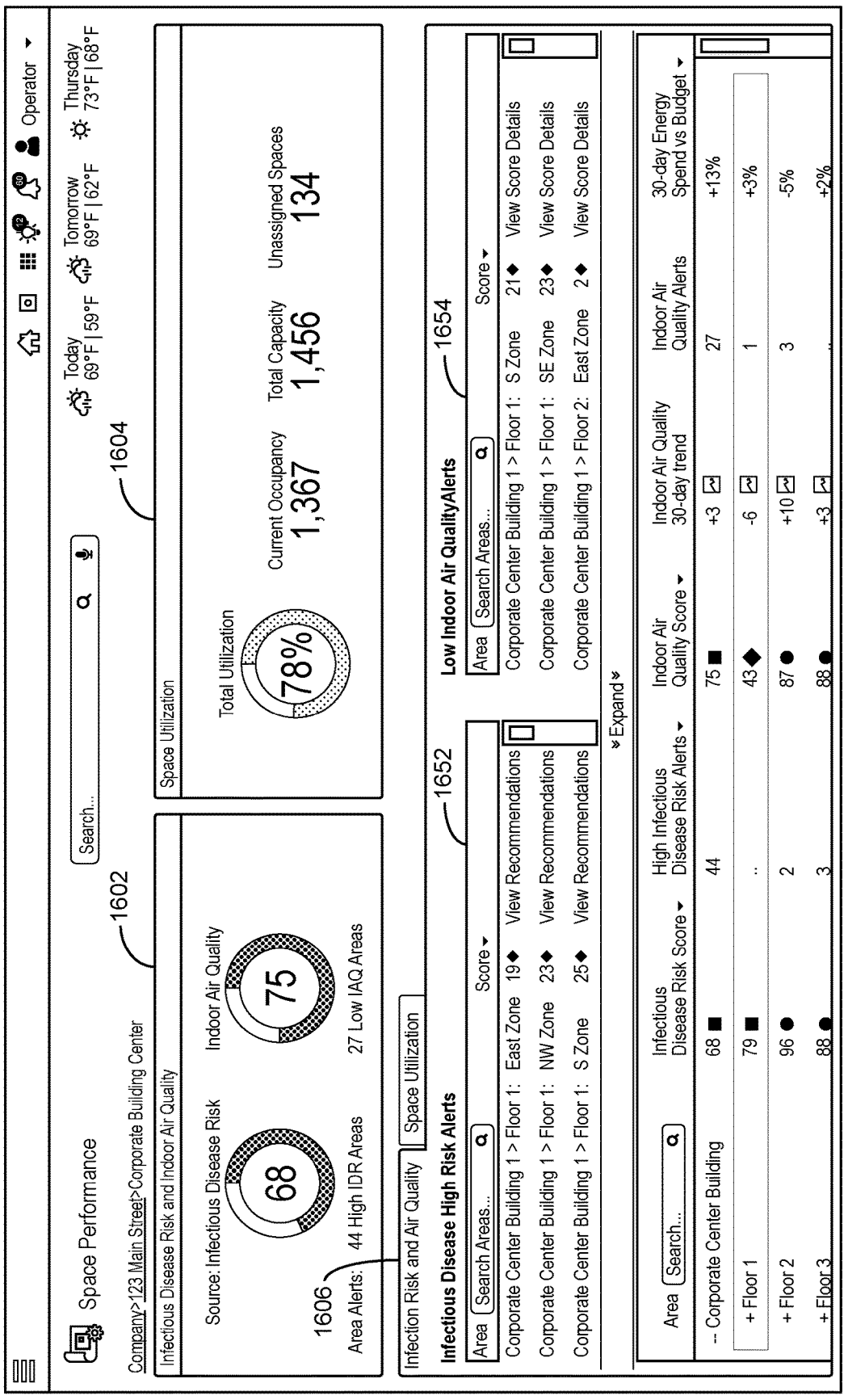


FIG. 16B

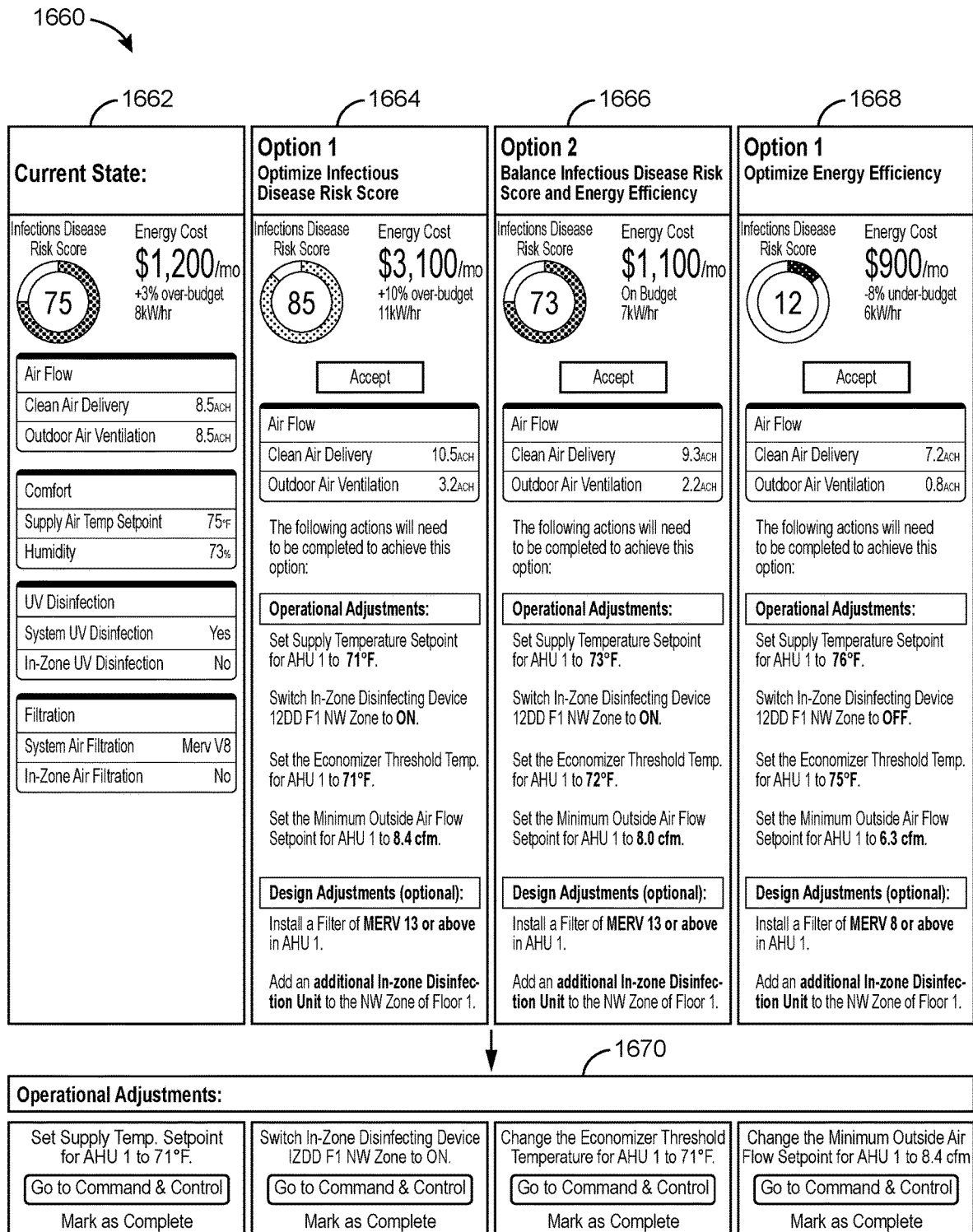


FIG. 16C

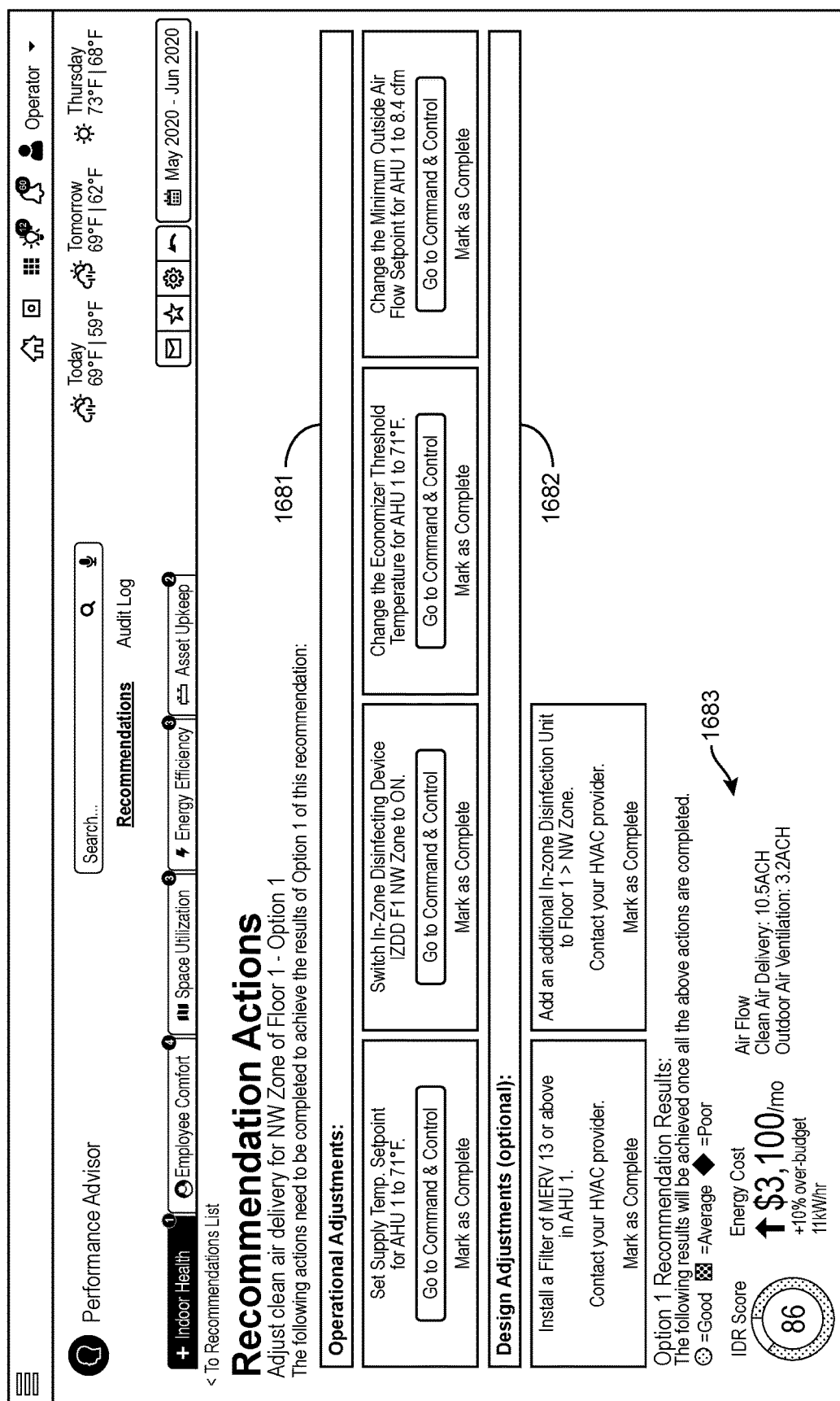
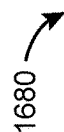
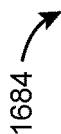


FIG. 16D



Performance Advisor

Search... Q

Recommendations Audit Log

Today 69°F | 59°F Tomorrow 69°F | 62°F Thursday 73°F | 68°F

May 2020 - Jun 2020

+ Indoor Health

Employee Comfort

Space Utilization

Energy Efficiency

Asset Upkeep

Undo Recommendation Actions for Option 1

Since you have now rejected Option 1, you will need to reset the following actions you have already completed.

Operational Adjustments:

Set Supply Temp. Setpoint for AHU 1 to 71°F.
Go to Command & Control
Mark as Complete

Switch In-Zone Disinfecting Device IZDD F1 NW Zone to ON.
Go to Command & Control
Mark as Complete

Change the Economizer Threshold Temperature for AHU 1 to 71°F.
Go to Command & Control
Mark as Complete

Change the Minimum Outside Air Flow Setpoint for AHU 1 to 8.4 cfm
Go to Command & Control
Mark as Complete

Design Adjustments (optional):

Install a Filter of MERV 13 or above in AHU 1.
Contact your HVAC provider.
Mark as Complete

Add an additional In-zone Disinfection Unit to Floor 1 > NW Zone.
Contact your HVAC provider.
Mark as Complete

Install a Filter of MERV 13 or above in AHU 1. Contact your HVAC provider. Mark as Complete	Add an additional In-zone Disinfection Unit to Floor 1 > NW Zone. Contact your HVAC provider. Mark as Complete
--	--

FIG. 16E

1687

Performance Advisor

Search...

Q

Audit Log

Today 69°F | 59°F

Tomorrow 69°F | 62°F

Thursday 73°F | 68°F

Home

Grid

Weather

Operator

1

Indoor Health

2

Employee Comfort

3

Space Utilization

4

Energy Efficiency

5

Asset Upkeep

May 2020 - Jun 2020

Recommendations

Audit Log

Recommendation Actions

Adjust clean air delivery for NW Zone of Floor 1 - Option 2

The following actions need to be completed to achieve the results of Option 1 of this recommendation:

Operational Adjustments:

Set Supply Temp. Setpoint for AHU 1 to 73°F.

Go to Command & Control

Mark as Complete

Switch In-Zone Disinfecting Device IZDD F1 NW Zone to ON.

Go to Command & Control

Mark as Complete

Change the Economizer Threshold Temperature for AHU 1 to 72°F.

Go to Command & Control

Mark as Complete

Change the Minimum Outside Air Flow Setpoint for AHU 1 to 8.0 cfm

Go to Command & Control

Mark as Complete

Design Adjustments (optional):

Install a Filter of MERV 13 or above in AHU 1.

Contact your HVAC provider.

Mark as Complete

Add an additional In-zone Disinfection Unit to Floor 1 > NW Zone.

Contact your HVAC provider.

Mark as Complete

Option 1 Recommendation Results:

The following results will be achieved once all the above actions are completed.

☺ = Good

☒ = Average

◆ = Poor

IDR Score

73

Energy Cost

↑ \$1,100/mo

On Budget

7kW/hr

Air Flow

Clean Air Delivery: 9.3ACH

Outdoor Air Ventilation: 2.2ACH

1688

1689

1690

FIG. 16F

1691

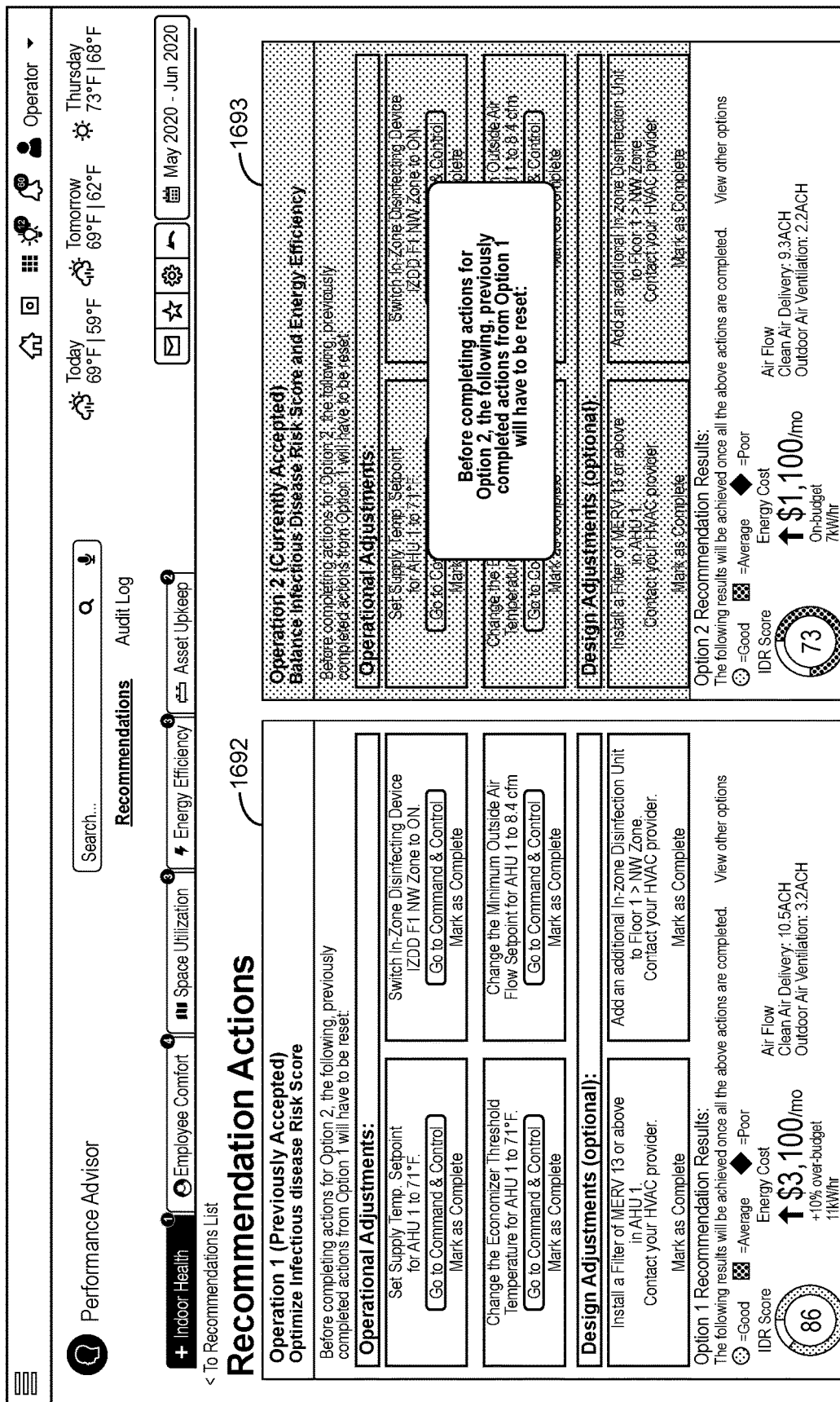


FIG. 16G

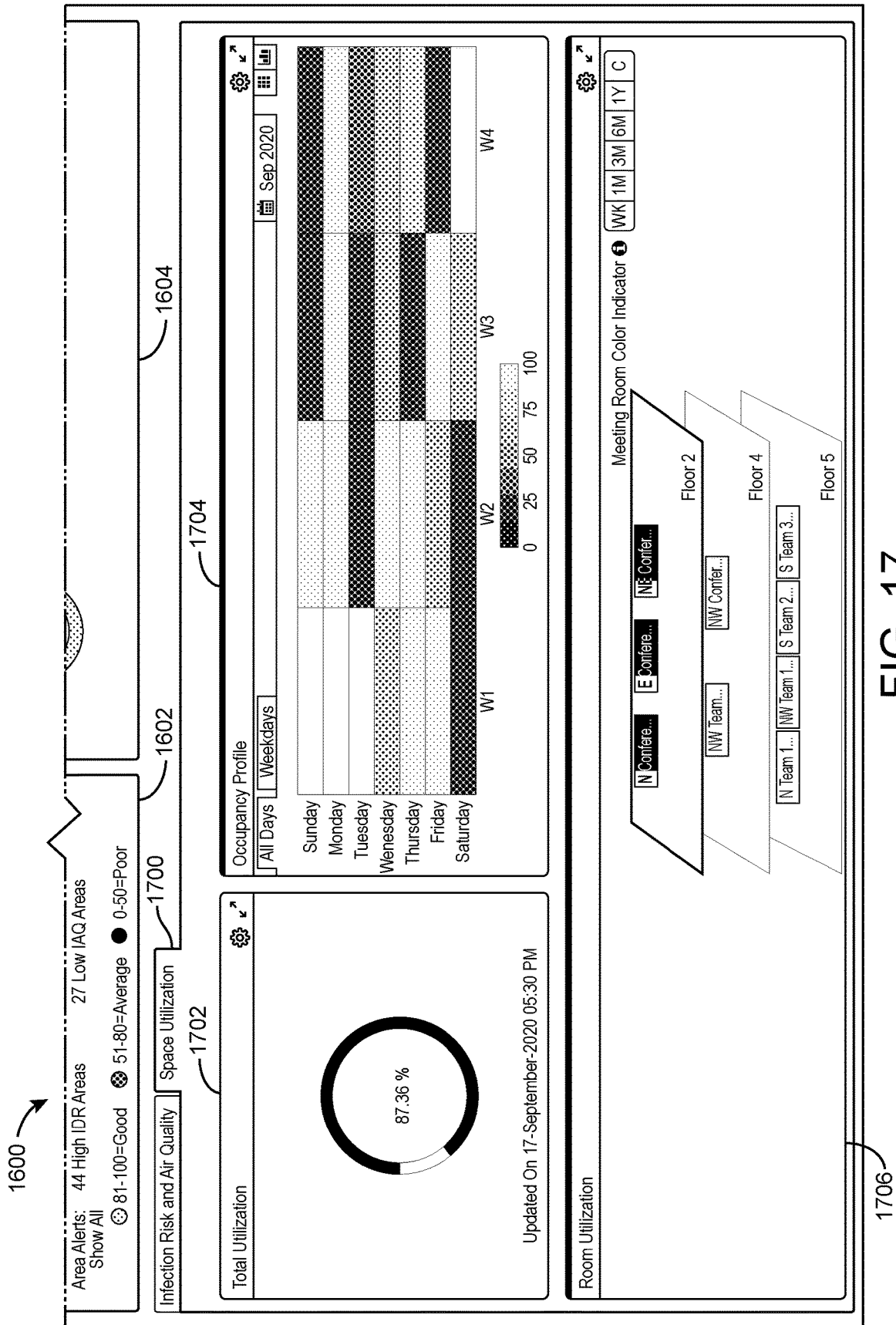


FIG. 17

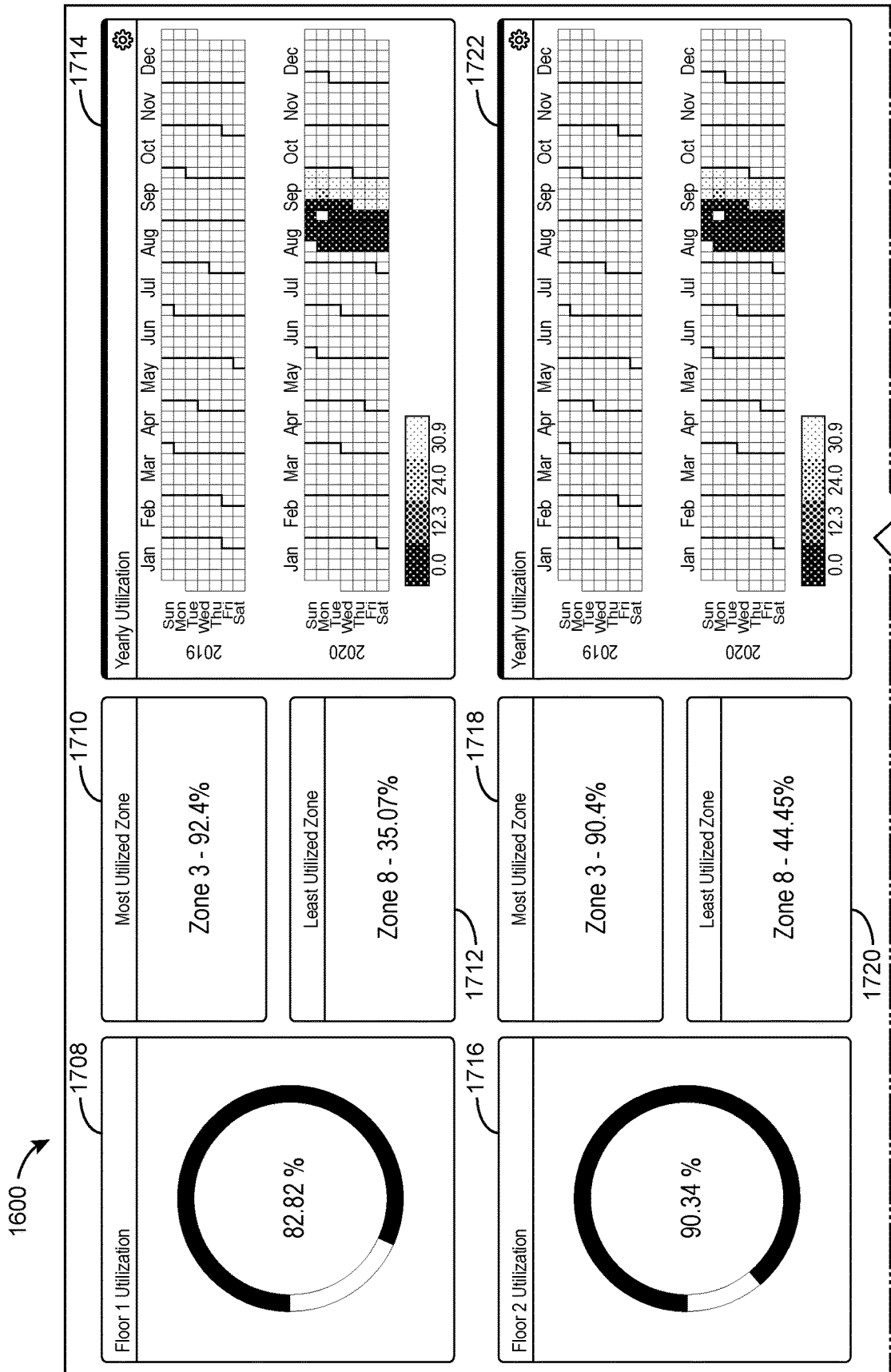


FIG. 18A

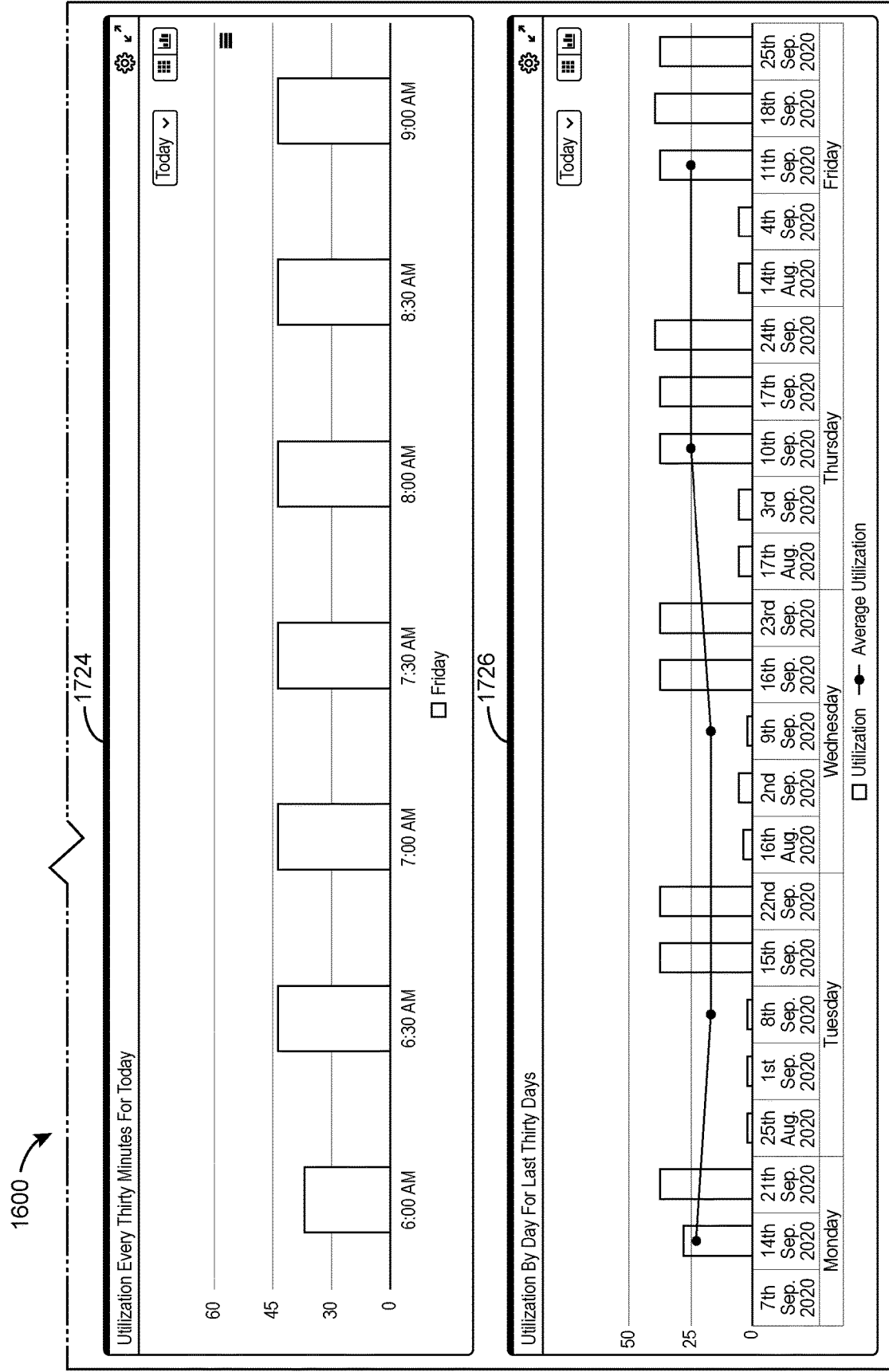


FIG. 18B

1900 →

404 — Occupant Health And Wellness Parameters

602 — Air Quality Parameters

Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Indoor Air Quality	Carbon Dioxide	Zone CO ₂ > (+/- X%) of SP for more than Y min	05	Total Occ Time / Z	No. of Instances	Score = AS* ((TI- DI)/TI)
Essential	Indoor Air Quality	Carbon Monoxide	Zone CO > (+/- X%) of SP for more than Y min	01	Total Occ Time / Z	No. of Instances	Score = AS* ((TI- DI)/TI)
Essential	Indoor Air Quality	Duct Static Pressure	Duct Static Press < (+/- X%) of SP for more than Y min	01	No. of Days	No. of Days	Score = AS* ((TI- DI)/TI)
Essential	Indoor Air Quality	Air Velocity	Air Velocity < (+/- X%) of SP for more than Y min	01	Total Occ Time / Z	No. of Instances	Score = AS* ((TI- DI)/TI)
Essential	Indoor Air Quality	Air Replacement	Night purge mode to replace air	01	NA	NA	Score = AS if system in place for use case
Enhance	Indoor Air Quality	TVOC	Zone TVOC > (+/- X%) of SP for more than Y min	01	Total Occ Time / Z	No. of Instances	Score = AS* ((TI- DI)/TI)
Enhance	Indoor Air Quality	Particulate Matters	PM > (+/- X%) of SP for more than Y min	01	Total Occ Time / Z	No. of Instances	Score = AS* ((TI- DI)/TI)
Optimum	Indoor Air Quality	Particulate Matters	Activate filtering when OA or RA PM is more than limit	01	NA	NA	Score = AS if system in place for use case
Optimum	Indoor Air Quality	Air Replacement	Provision to raise complain about smell within space	01	NA	NA	Score = AS if system in place for use case
Optimum	Indoor Air Quality	Air Replacement	Provision to raise request replace occupied area air	01	NA	NA	Score = AS if system in place for use case

FIG. 19

2000 →

404 — Occupant Health And Wellness Parameters

616 — Thermal Comfort Parameters

Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Thermal Comfort	Dry Bulb Temp	Zone Temp > (+/- X%) of SP for more than Y min	10	Total Occ Time / Z	No. of Instances	Score = $AS^* ((TI - DI)/TI)$
Essential	Thermal Comfort	Dry Bulb Temp	HVAC On/Off control based on Occupancy in space	02	NA	NA	Score = AS if system in place for use case
Essential	Thermal Comfort	Personalized Control	Desk Temp > (+/- X%) of SP for more than Y min	05	Total Occ Time / Z	No. of Instances	Score = $AS^* ((TI - DI)/TI)$
Enhance	Thermal Comfort	Optimum Start	Zone Temp > (+/- X%) of SP after Y Occu. min	02	No. of Days	No. of Days	Score = $AS^* ((TI - DI)/TI)$
Optimum	Thermal Comfort	Dry Bulb Temp	AI based occupant set point adjustment	01	NA	NA	Score = AS if system in place for use case
Optimum	Thermal Comfort	Dry Bulb Temp	Auto zone SP adjustment based on OA temp	02	NA	NA	Score = AS if system in place for use case
Optimum	Thermal Comfort	Humidity Control	Zone RH > +/- X%) of SP for more than Y min	02	Total Occ Time / Z	No. of Instances	Score = $AS^* ((TI - DI)/TI)$

FIG. 20

2100 →

404 — Occupant Health And Wellness Parameters

614 — Light Parameters

Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Indoor Light	Desk Light Control	Light on/off control based on occupancy in space	02	NA	NA	Score = AS if system in place for use case
Essential	Indoor Light	Desk Light Control	Provision to control desk light	02	NA	NA	Score = AS if system in place for use case
Enhance	Indoor Light	Meeting Room	Provision for Mood Light control	01	NA	NA	Score = AS if system in place for use case
Enhance	Indoor Light	Desk Light Control	Desk light intensity control based on outdoor light	01	NA	NA	Score = AS if system in place for use case
Enhance	Indoor Light	Desk Light Control	Provision to control desk light intensity	01	NA	NA	Score = AS if system in place for use case
Optimum	Outdoor Light	Outdoor Conditions	Notify occupant when outside conditions are optimum	01	NA	NA	Score = AS if system in place for use case
Optimum	Indoor Light	Desk Light Control	Provision to control desk light color	01	NA	NA	Score = AS if system in place for use case

FIG. 21

2200

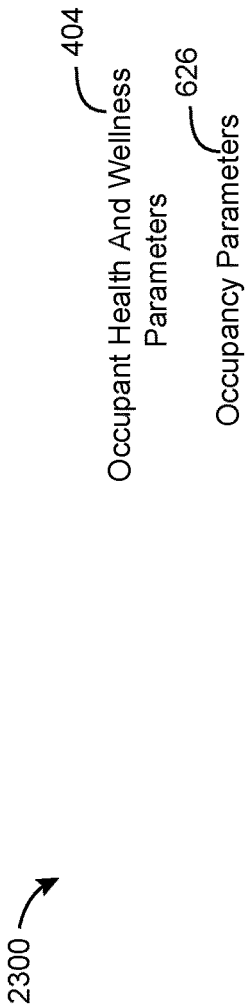
Occupant Health And Wellness Parameters

404

Light Sunshade Parameters

Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Sunshade	Sunshade control	Automatic Sunshade Control based on sun position	01	No. of instances	No. of Instances	Score = AS* ((TI-DI)/TI)
Essential	Sunshade	Sunshade Control	Provision to control sunshade for occupant	02	NA	NA	Score = AS if system in place for use case
Optimum	Sunshade	Sunshade Control	Sunshade opening alert when outside conditions are optimum	01	NA	NA	Score = AS if system in place for use case

FIG. 22



Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Zone Occupancy	No. of Occupant	No. of occupant < limit for more than 15 min	02	NA	NA	Score = AS* ((TI - DI)/TI)
Essential	Cafeteria Occupancy	No. of Occupant	Alert when cafeteria occupancy is less than limit	02	NA	NA	Score = AS if system in place for use case

FIG. 23

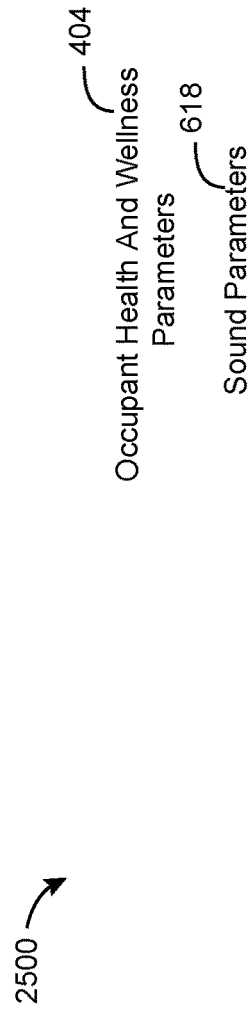
2400 →

404 — Occupant Health And Wellness Parameters

620 — Seating Parameters

Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Indoor Light	Hot Desking	Provision to book standing desk	01	NA	NA	Score = AS if system in place for use case
Essential	Indoor Light	Hot Desking	Provision to check standing desk sanitization status *	02	NA	NA	Score = AS if system in place for use case
Essential	Indoor Light	Hot Desking	Provision to request standing desk sanitization	01	NA	NA	Score = AS if system in place for use case
Enhance	Indoor Light	Hot Desking	Provision to book seat with view	01	NA	NA	Score = AS if system in place for use case
Enhance	Indoor Light	Seating	Flexible desk arrangement to collaborate effectively	01	NA	NA	Score = AS if system in place for use case
Optimum	Outdoor Light	Seating	Provision to adjust posture and height of desk	01	NA	NA	Score = AS if system in place for use case
Optimum	Indoor Light	Seating	AI based auto posture and height adjustment	01	NA	NA	Score = AS if system in place for use case

FIG. 24



Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Sound	Noise Level	Noise level should be less than threshold limit all day	02	No. of Instances	No. of Instances	Score = AS if system in place for use case
Essential	Sound	Noise Level	Provision to raise complain if occupied space in noisy *	03	NA	NA	Score = AS if system in place for use case
Enhance	Sound	Music	Provision to play music in gym during work - out if alone	01	NA	NA	Score = AS if system in place for use case
Enhance	Sound	Music	Automatically play music in cafeteria during lunch	01	NA	NA	Score = AS if system in place for use case

FIG. 25

2600 →

404 — Occupant Health And Wellness Parameters

642 — Sanitization Parameters

Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Sanitization	Sanitization	Common Space Sanitization Schedule	01	NA	NA	Score = AS if system in place for use case
Essential	Sanitization	Sanitization	Common Space Sanitization Status	03	NA	NA	Score = AS if system in place for use case
Essential	Sanitization	Sanitization	Common Space Sanitization request *	02	NA	NA	Score = AS if system in place for use case

FIG. 26

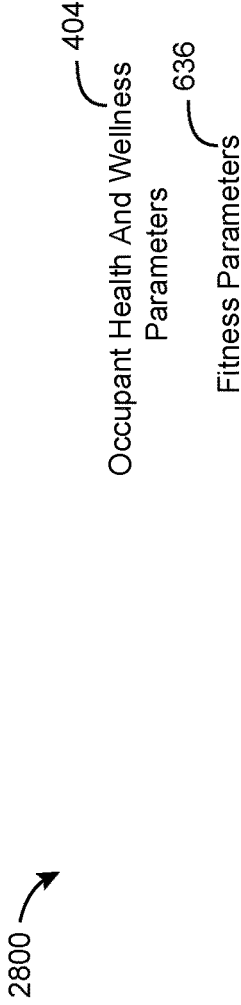
2700 →

404 — Occupant Health And Wellness Parameters

634 — Food Parameters

Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Food	Food Ordering	Cafeteria Food menu along with nutrition	02	NA	NA	Score = AS if system in place for use case
Essential	Food	Nourishment	Provide Nutrition Education via Occupant app	02	NA	NA	Score = AS if system in place for use case
Enhance	Food	Food Ordering	Provision to order food from occupant app	01	NA	NA	Score = AS if system in place for use case
Enhance	Food	Fruit Basket	Fruit Basket arrival notification to occupant	01	NA	NA	Score = AS if system in place for use case
Enhance	Food	Food Break	Customized lunch and coffee break alerts to occupant	01	NA	NA	Score = AS if system in place for use case
Optimum	Food	Eating Area	Navigation to nearest indoor and outdoor eating area	01	NA	NA	Score = AS if system in place for use case
Optimum	Food	Food	Navigation to nearest farmers' market	01	NA	NA	Score = AS if system in place for use case

FIG. 27



Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Fitness	Fitness program	Alerts and notifications of fitness program by organization	01	NA	NA	Score = AS if system in place for use case
Essential	Fitness	Fitness awareness	Promote Physical Activity	03	NA	NA	Score = AS if system in place for use case
Enhance	Fitness	Movement	Customized no movement reminder for occupant	02	NA	NA	Score = AS if system in place for use case
Enhance	Fitness	Gym occupancy status	Customized reminder when gym is unoccupied	01	NA	NA	Score = AS if system in place for use case
Enhance	Fitness	Bicycle stand booking	Provision to book bicycle stand in advance	01	NA	NA	Score = AS if system in place for use case

FIG. 28

2900 →

404 — Occupant Health And Wellness Parameters

638 — Handwashing Parameters

Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Hand Washing	Hand Washing	Hand washing reminder when occupant enter in office	03	NA	NA	Score = AS if system in place for use case
Essential	Hand Washing	Hand Washing	Proper hand washing guide in occupant app	01	NA	NA	Score = AS if system in place for use case
Essential	Hand Washing	Hand Washing	Hand wash alert when in contact with COVID-19 person	02	NA	NA	Score = AS if system in place for use case
Enhance	Hand Washing	Soap Dispenser	Raise a request to refill soap dispenser	01	NA	NA	Score = AS if system in place for use case
Enhance	Hand Washing	Touchless	Touchless handwashing	01	NA	NA	Score = AS if system in place for use case
Optimum	Hand washing	Hand Washing	Average time spent for handwashing less than X sec.	01	NA	NA	Score = AS if system in place for use case

FIG. 29

3000 →

404 — Occupant Health And Wellness Parameters

632 — Water Quality Parameters

Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Water Quality	Contaminant Level	Contaminant level is below threshold limit	05	No. of instances	No. of Instances	Score = $AS * (TI - DI) / TI$
Essential	Water Consumption	Awareness	Alerts and notification for spread awareness	01	NA	NA	Score = AS if system in place for use case
Essential	Water Quality	Hot Water Quality	Provision to raise temperature of Hot Water to kill Ameba	02	NA	NA	Score = AS if system in place for use case
Enhance	Water Quality	Water refilling Station	Navigation to nearest hot/cold water refilling source	01	NA	NA	Score = AS if system in place for use case
Enhance	Water Quality	Water refilling Station	Provision to raise request to refill water refilling station	01	NA	NA	Score = AS if system in place for use case
Enhance	Water Quality	Water Quality	Provision to raise complain about water quality	01	NA	NA	Score = AS if system in place for use case
Optimum	Water Quality	Dehydration alert	AI based reminder for occupant to drink water	01	NA	NA	Score = AS if system in place for use case

FIG. 30

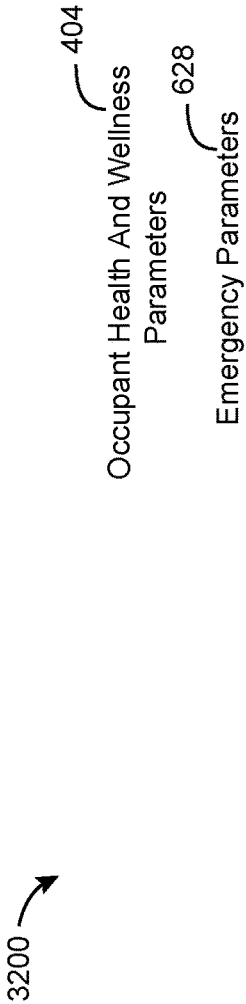
3100 →

404
Occupant Health And Wellness
Parameters

634
Pest Control Parameters

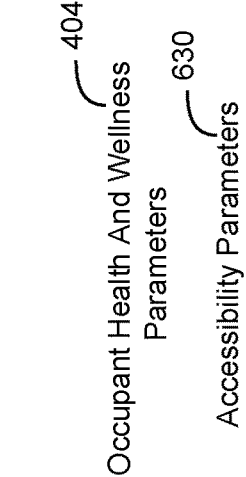
Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Pest Control	Pest Control	Pest control schedule of occupied space alert	01	NA	NA	Score = AS if system in place for use case
Essential	Pest Control	Pest Control	Pest control status of occupied space	01	NA	NA	Score = AS if system in place for use case
Essential	Pest Control	Pest Control	No entry alert during pest control cool down period	02	NA	NA	Score = AS if system in place for use case

FIG. 31



Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Emergency	SOS	SOS button in occupant app case of emergency	01	NA	NA	Score = AS if system in place for use case
Essential	Emergency	SOS	Alert & Location sharing with immediate family	01	NA	NA	Score = AS if system in place for use case
Essential	Emergency	SOS	SOS alert when inorganic gas level is dangerous	01	NA	NA	Score = AS if system in place for use case
Enhance	Emergency	SOS	SOS alert on Occupant in case of nearby bush fire	01	NA	NA	Score = AS if system in place for use case

FIG. 32



Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Emergency	Outdoor access	Navigation to nearest garden	02	NA	NA	Score = AS if system in place for use case
Essential	Emergency	Indoor Navigation	Navigation to nearest green space	01	NA	NA	Score = AS if system in place for use case
Essential	Emergency	Indoor Navigation	Meeting Room Navigation	01	NA	NA	Score = AS if system in place for use case
Enhance	Emergency	Indoor Navigation	Indoor Navigation to find employee	01	NA	NA	Score = AS if system in place for use case

FIG. 33



Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Mind	Mental Health	Mental Health awareness	02	NA	NA	Score = AS if system in place for use case
Essential	Mind	Mental Health	Access to organization Mental Health Education program	01	NA	NA	Score = AS if system in place for use case
Essential	Mind	Suicide Prevention	Access to suicide prevention resources	01	NA	NA	Score = AS if system in place for use case
Enhance	Mind	Stress	Access to organization Stress Management Programs	01	NA	NA	Score = AS if system in place for use case

FIG. 34

3500

404

Occupant Health And Wellness Parameters

624

Social Parameters

Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Social	Social	Alerts and notification of organization social events	01	NA	NA	Score = AS if system in place for use case
Essential	Social	Social	Colleague birthday reminder	01	NA	NA	Score = AS if system in place for use case
Essential	Social	Social	Nearby Social events	01	NA	NA	Score = AS if system in place for use case

FIG. 35

3600 →

Occupant Health And Wellness Parameters

404 →

Physical User Health Parameters

Category	Parameter	Sub parameter	Criteria	Allocated Score (AS)	Total Instances (TI)	Deviation Instances (DI)	Score Calculation
Essential	Eyes	Eyes Relaxation	Customized alerts to occupant to look away from screen	01	NA	NA	SS = AS if customized alerts to occupant to look away from screen
Essential	Disease Control	Social Distancing	Provision alert occupant when someone is less than 3 feet distance	02	NA	NA	SS = AS if provision alert occupant when someone is less than 3 feet distance
Enhance	Disease Control	Medical Leave	Provision to update sick leave in occupant app	01	NA	NA	SS = AS if provision to update sick leave in occupant app
Enhance	Disease Control	Contact Tracing	Provision for contact tracing	01	NA	NA	SS = AS if provision for contact tracing
Enhance	Disease Control	Air Replacement	Provision for air replacement request in case nearby employee infected by Viral disease	01	NA	NA	SS = AS if provision for air replacement request in case nearby employee infected by Viral disease
Optimum	Health	Health Data	Alerts and Notification to occupant when irregularity in health data	01	NA	NA	SS = AS if Alerts and Notification to occupant when irregularity in health data

FIG. 36

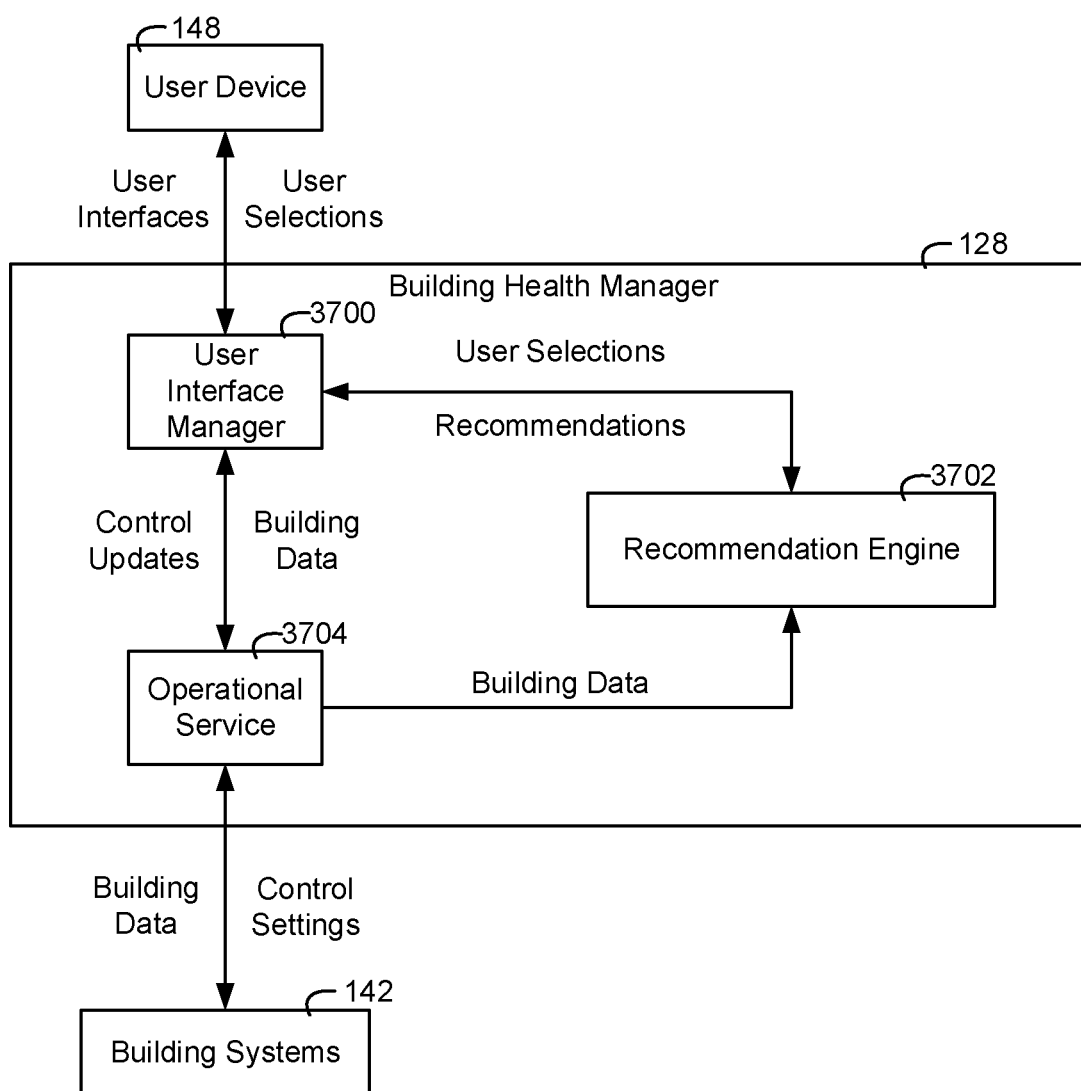


FIG. 37

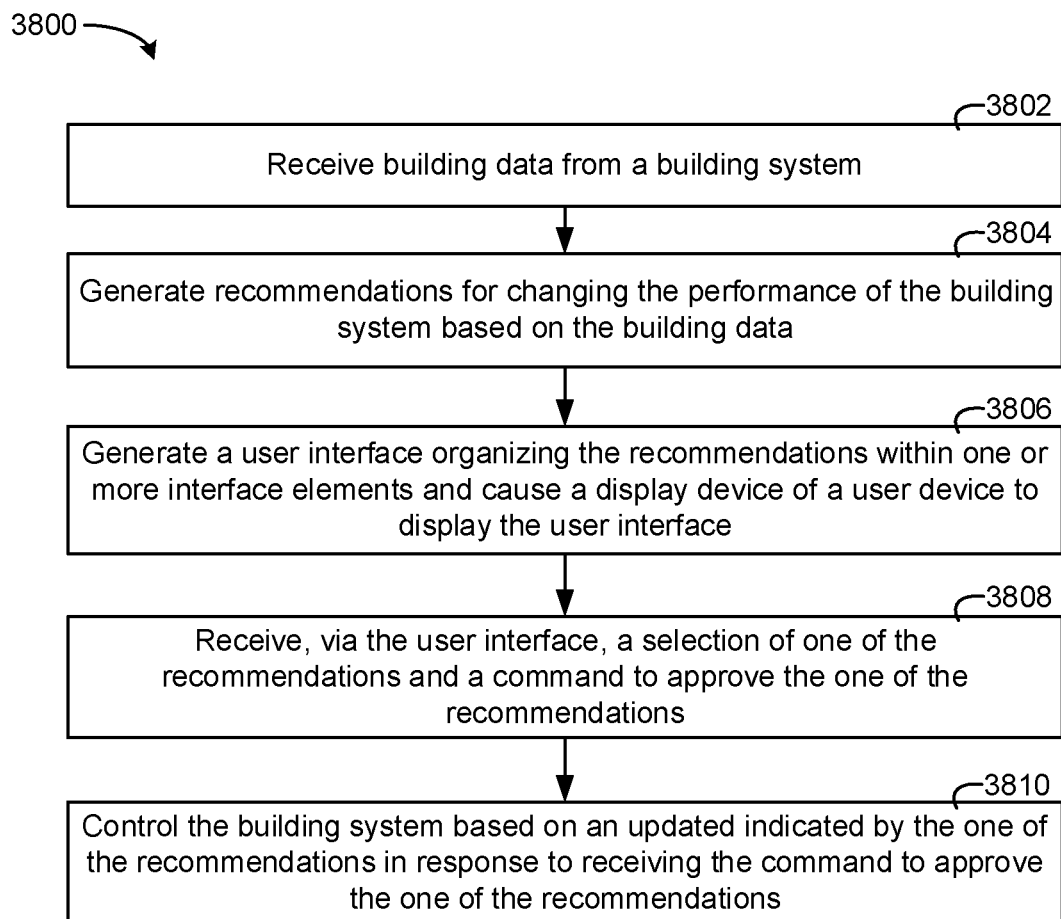


FIG. 38

3900

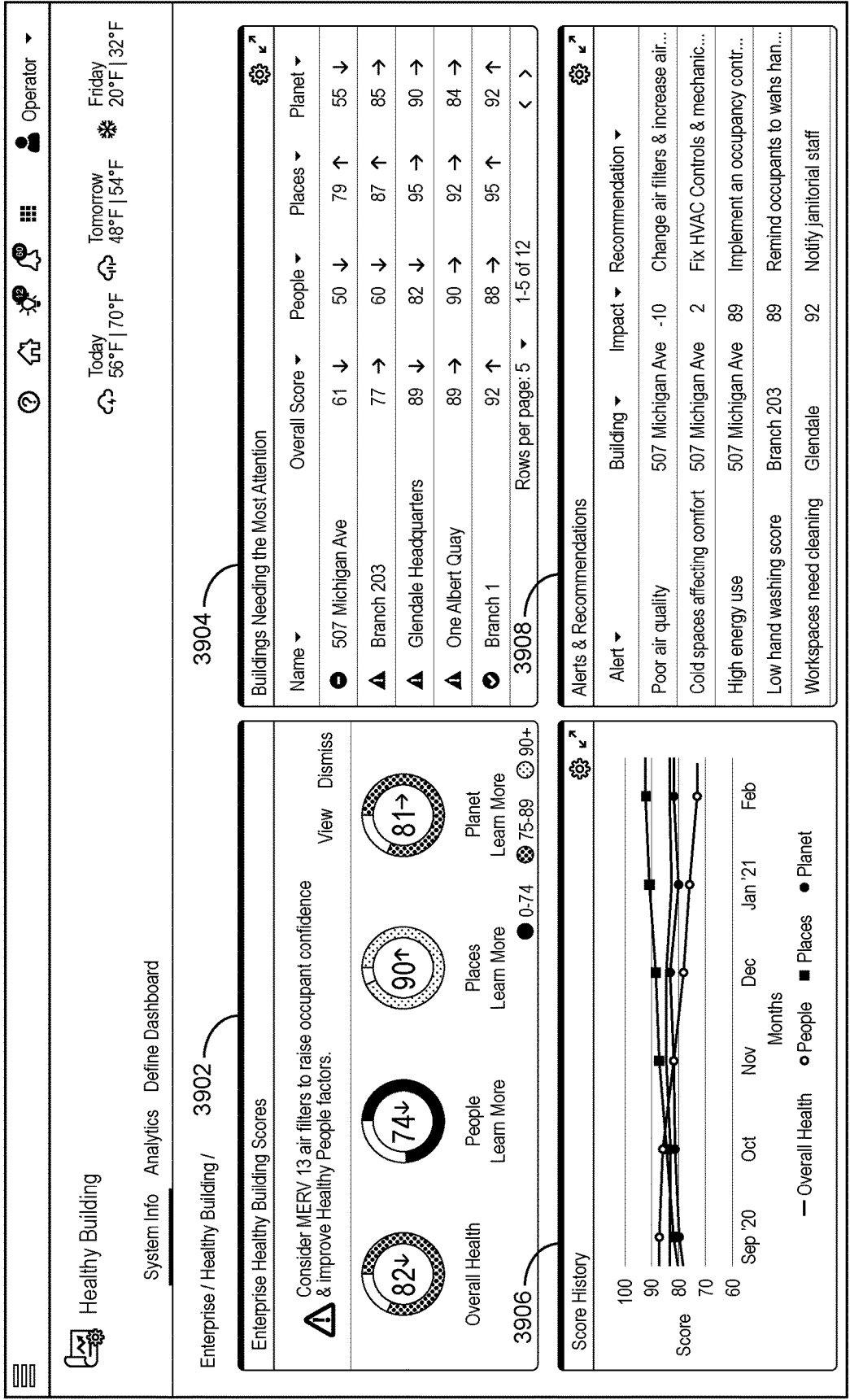


FIG. 39

4000

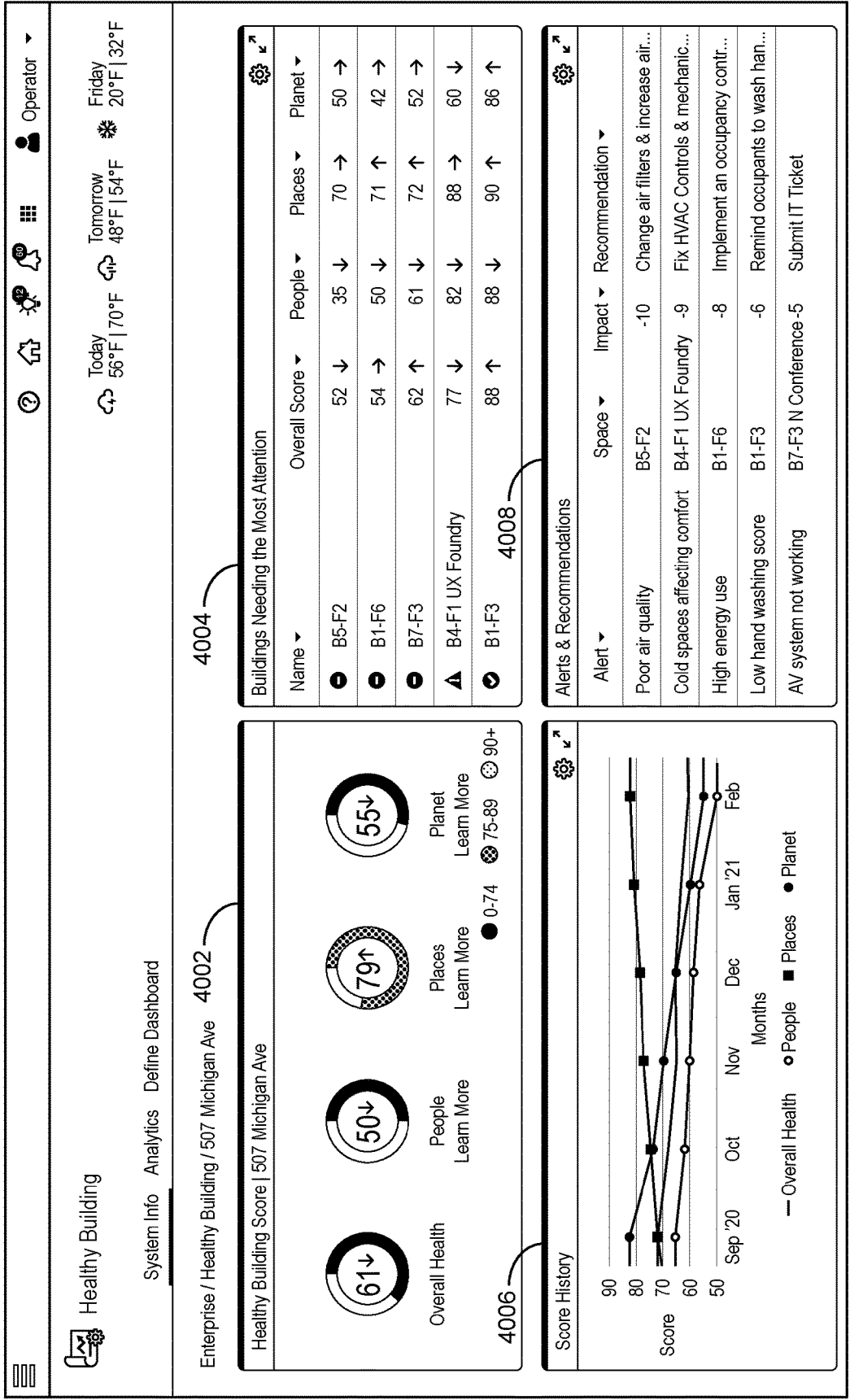


FIG. 40

4100

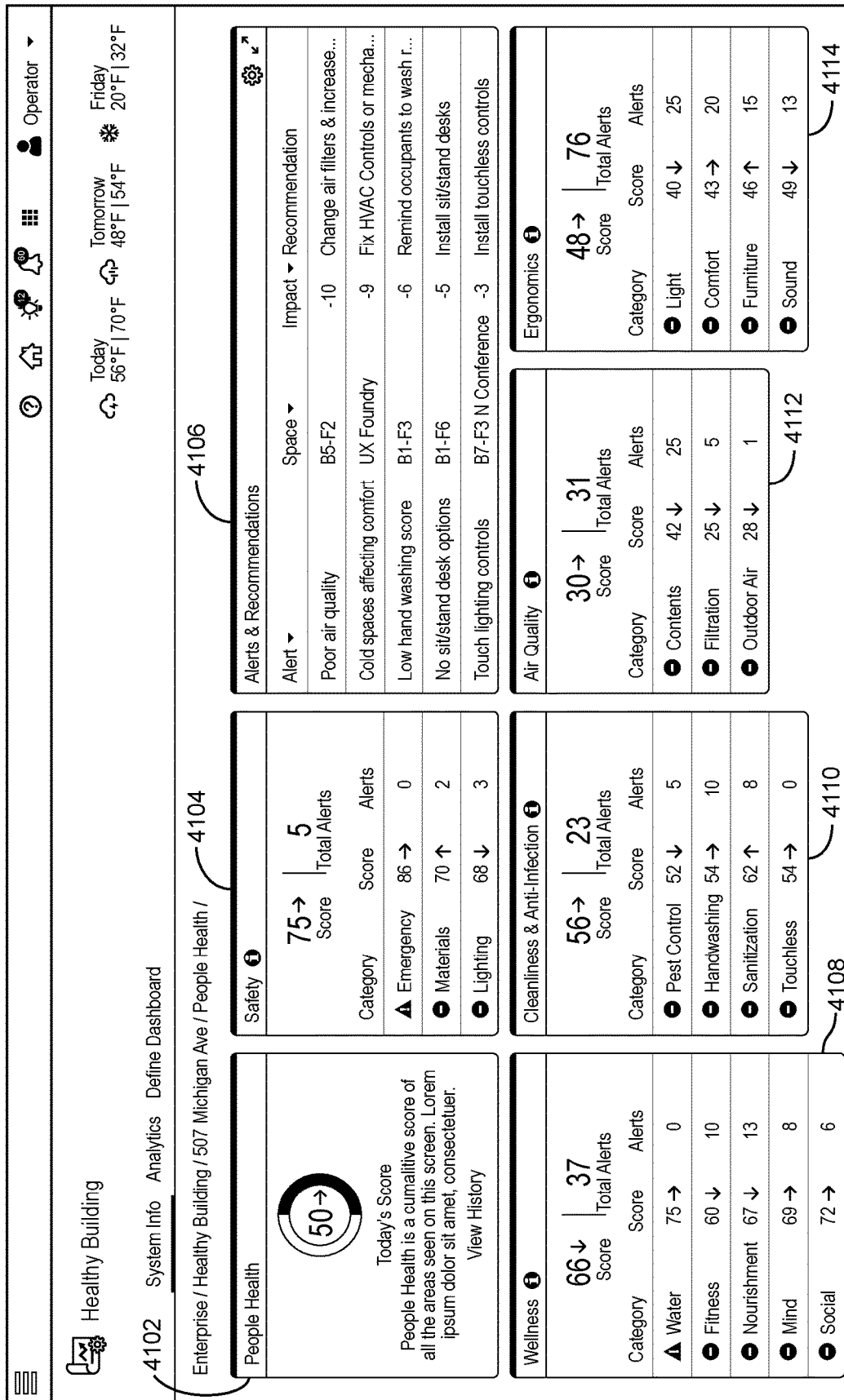


FIG. 41

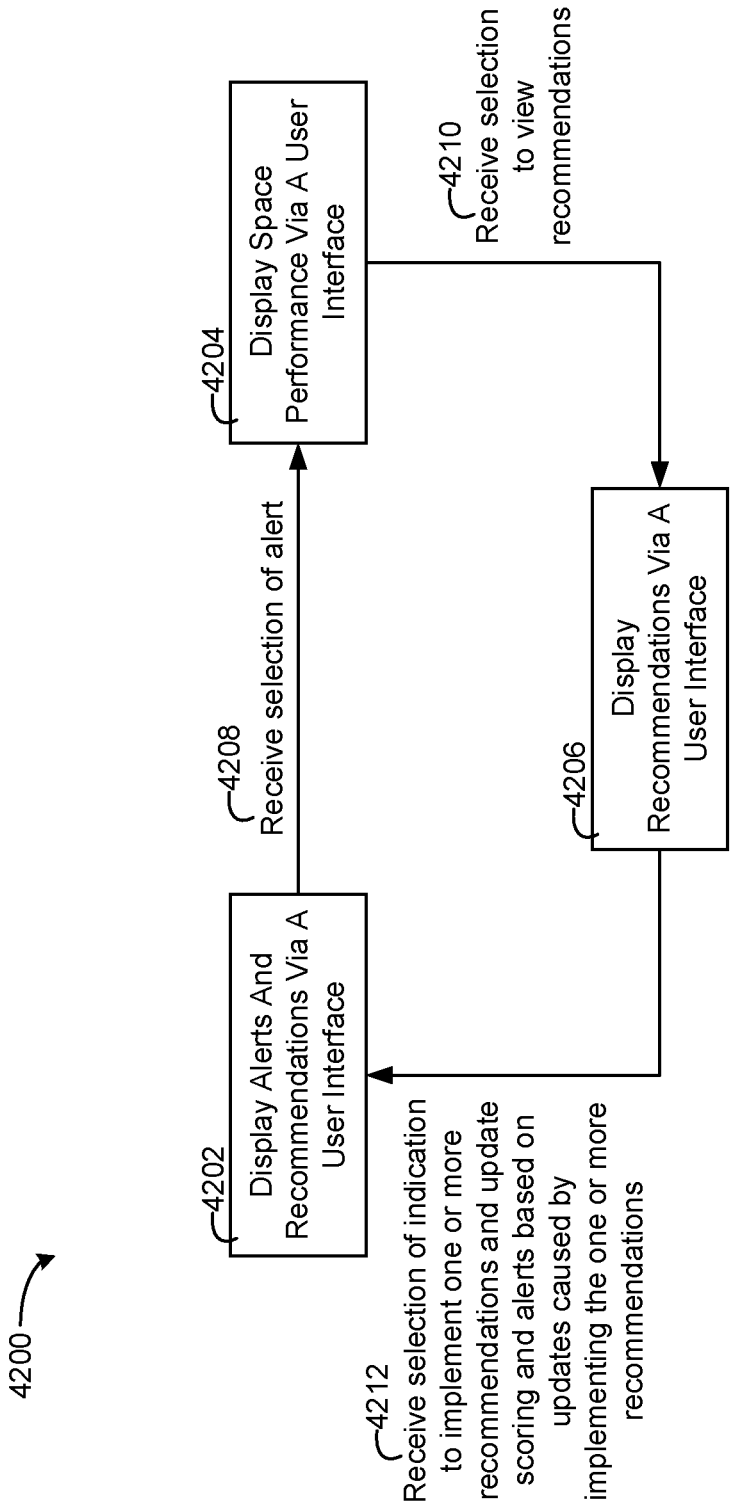


FIG. 42

4000

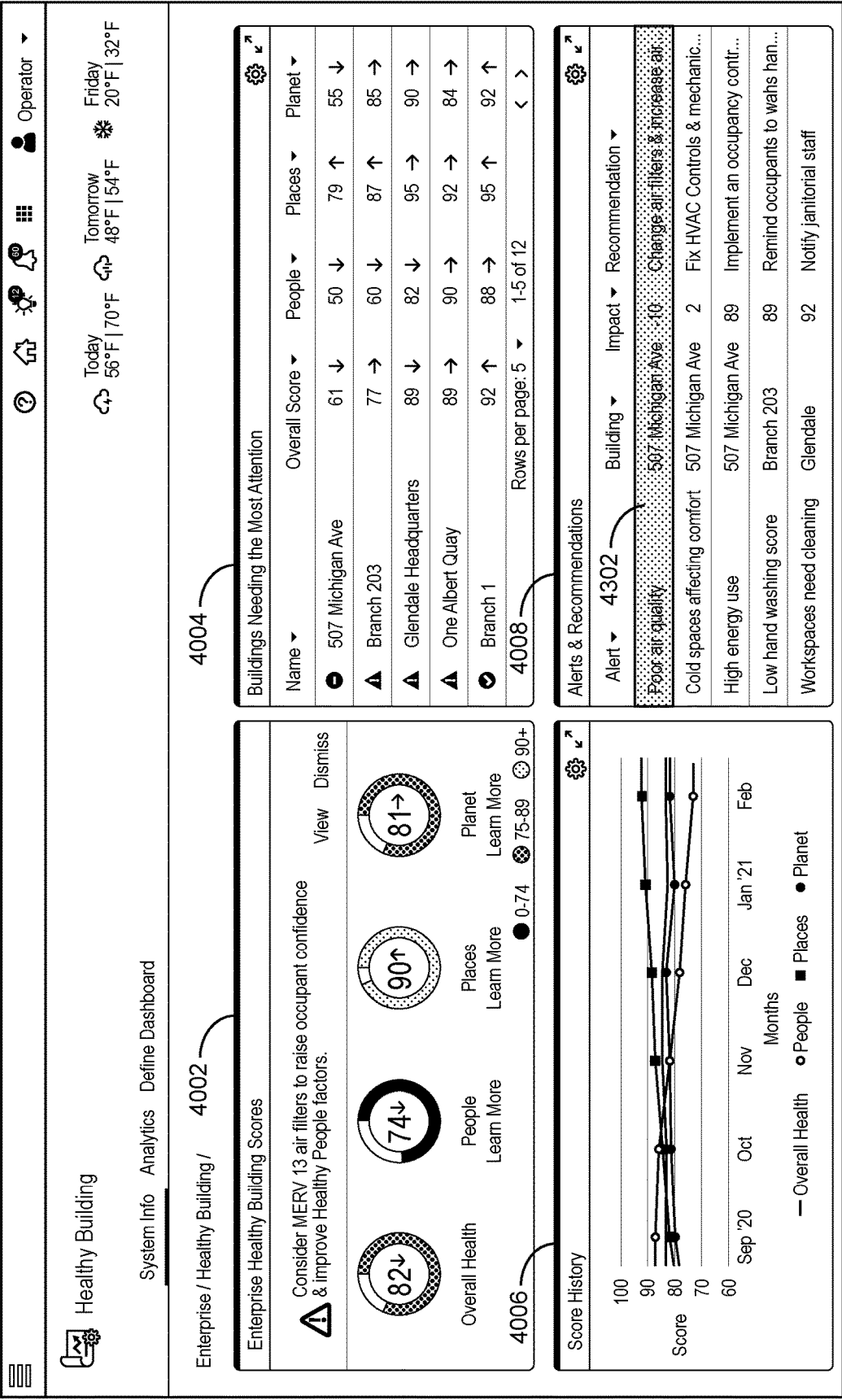
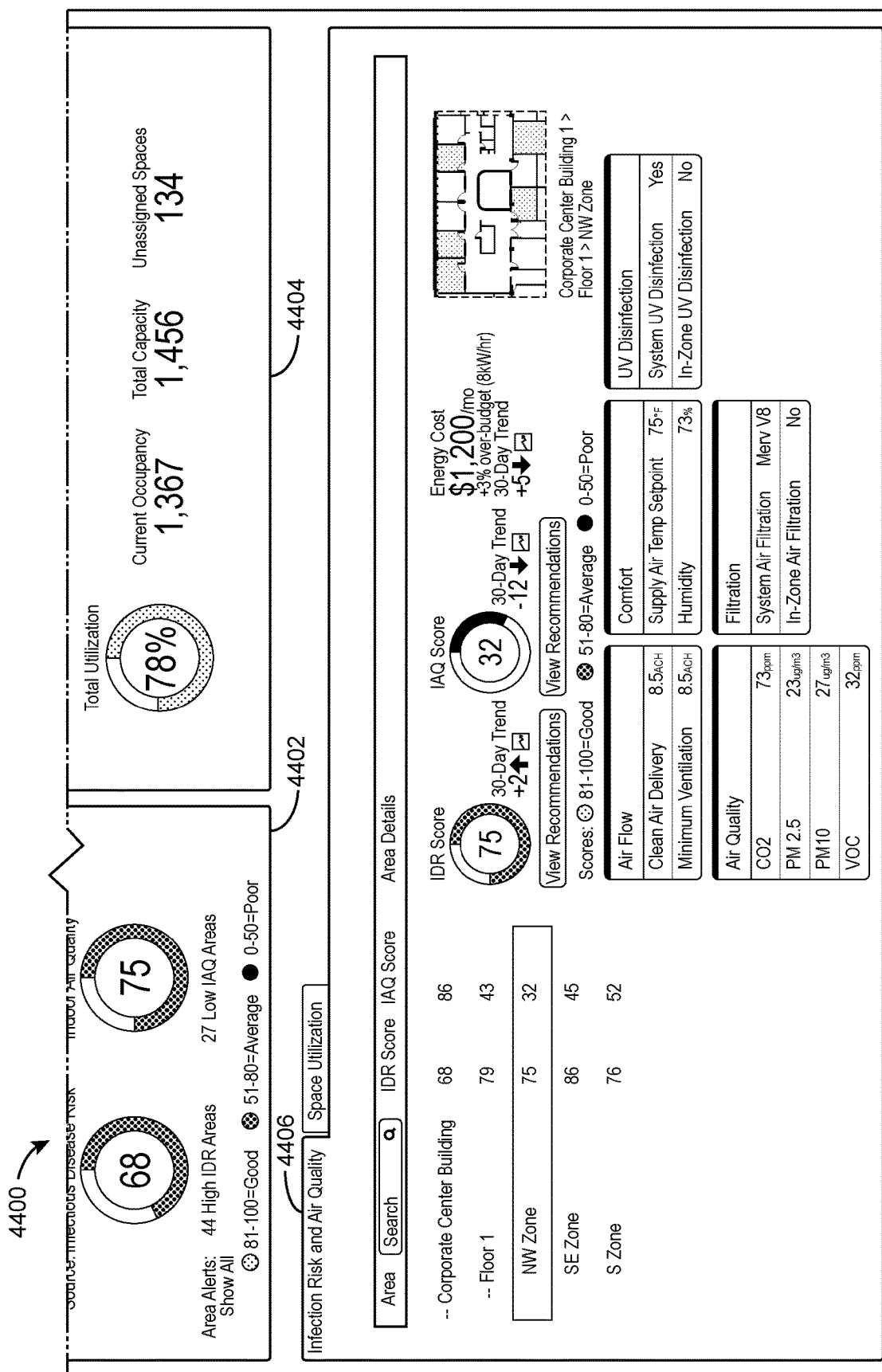


FIG. 43



4500

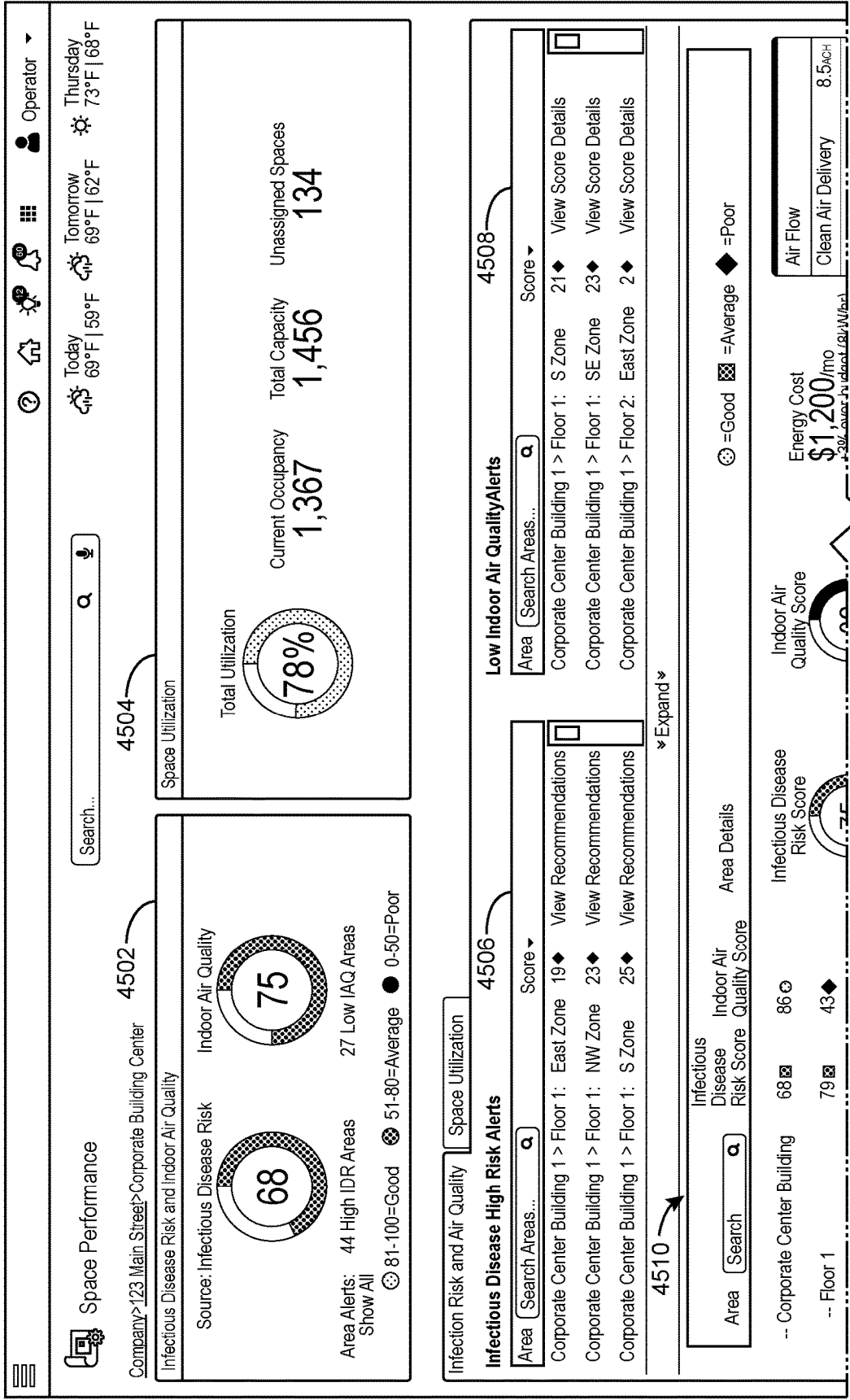


FIG. 45A

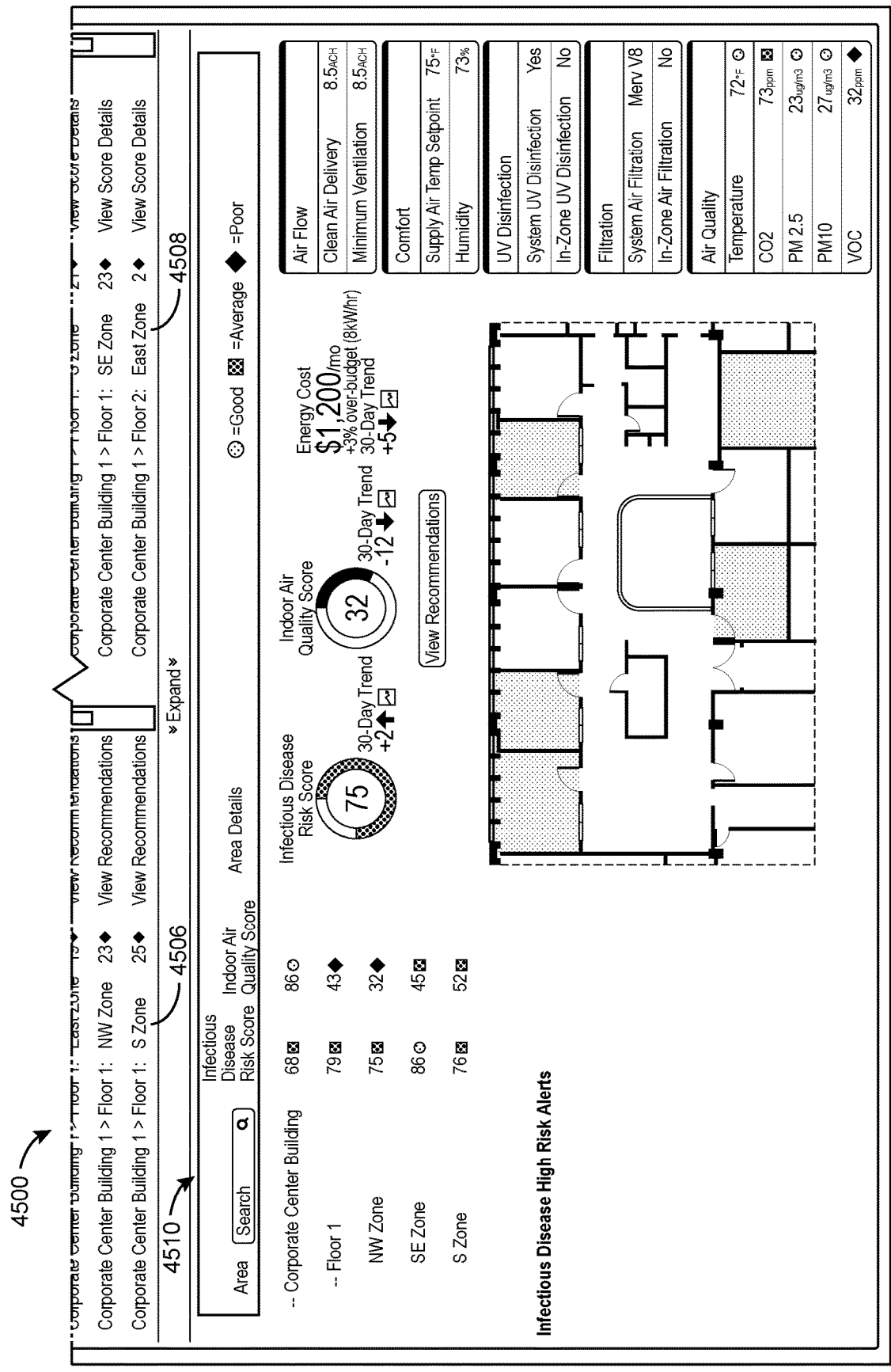


FIG. 45B

4600

Adjust clean air delivery rate to achieve lower infectious disease transmission risk.

Current State:



Air Flow	
Clean Air Delivery	8.5 _{ACH}
Minimum Ventilation	8.5 _{ACH}

Comfort	
Supply Air Temp Setpoint	75°F
Humidity	73%

UV Disinfection	
System UV Disinfection	Yes
In-Zone UV Disinfection	No

Air Quality	
CO ₂	73 _{ppm}
PM _{2.5}	23 _{ug/m3}
PM ₁₀	27 _{ug/m3}
VOC	32 _{ppm}

Filtration	
System Air Filtration	Merv V8
In-Zone Air Filtration	No

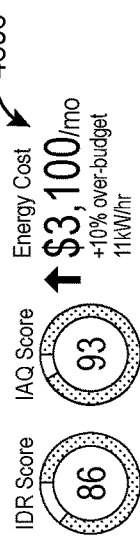
Scores: 81-100=Good 51-80=Average 0-50=Poor

4604

Recommendations:

Choose from the options below to optimize between airborne infection risk and energy spend. [View Advanced Selector](#)

Option 1:



Air Flow	
Clean Air Delivery	10.5 _{ACH}
Minimum Ventilation	3.2 _{ACH}

Comfort	
Supply Air Temp Setpoint	71°F
Humidity	65%

UV Disinfection	
System UV Disinfection	No
In-Zone UV Disinfection	No

Air Quality	
CO ₂	52 _{ppm}
PM _{2.5}	18 _{ug/m3}
PM ₁₀	21 _{ug/m3}
VOC	16 _{ppm}

Filtration	
System Air Filtration	Merv V8
In-Zone Air Filtration	No

FIG. 46A

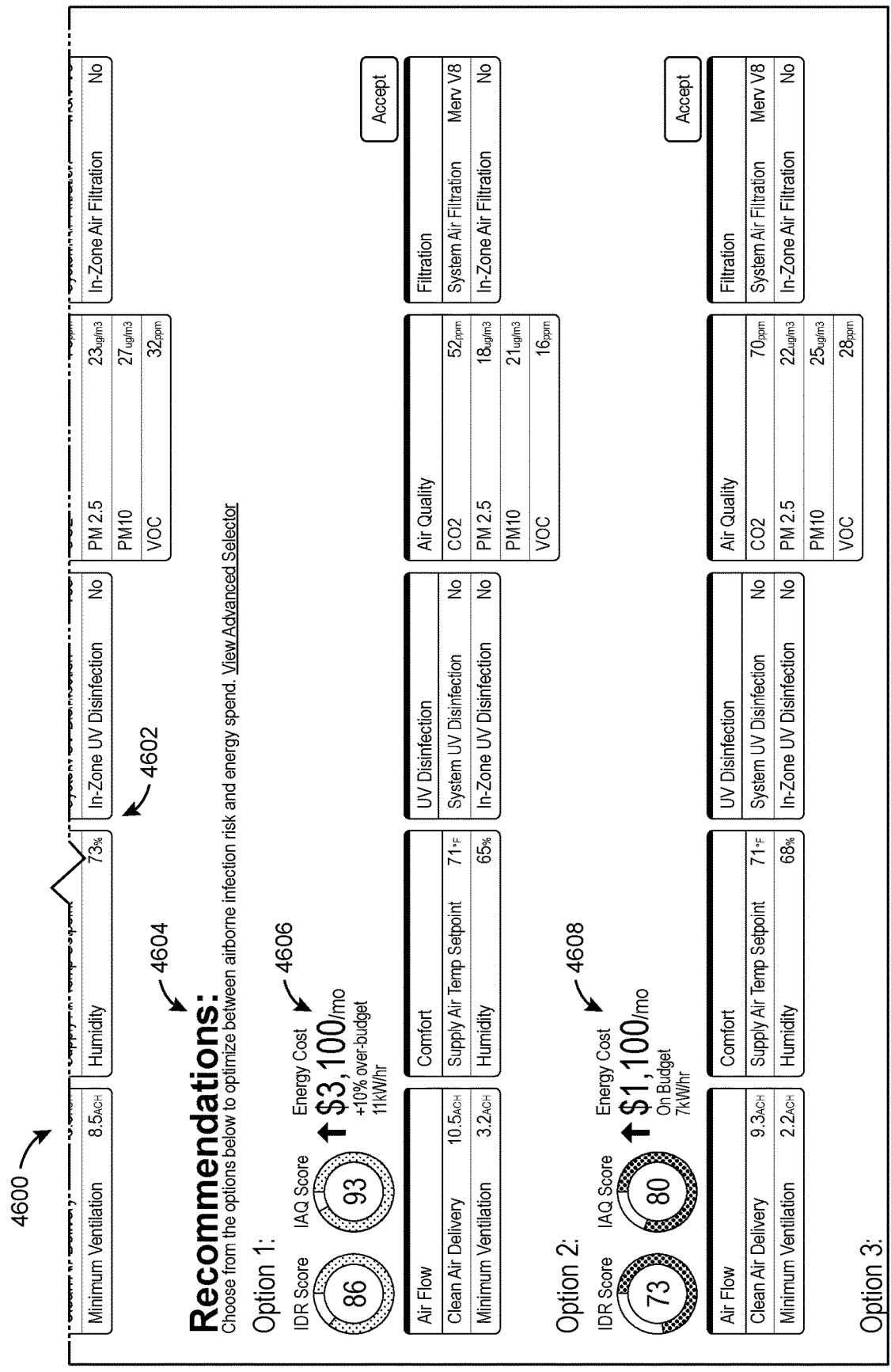


FIG. 46B

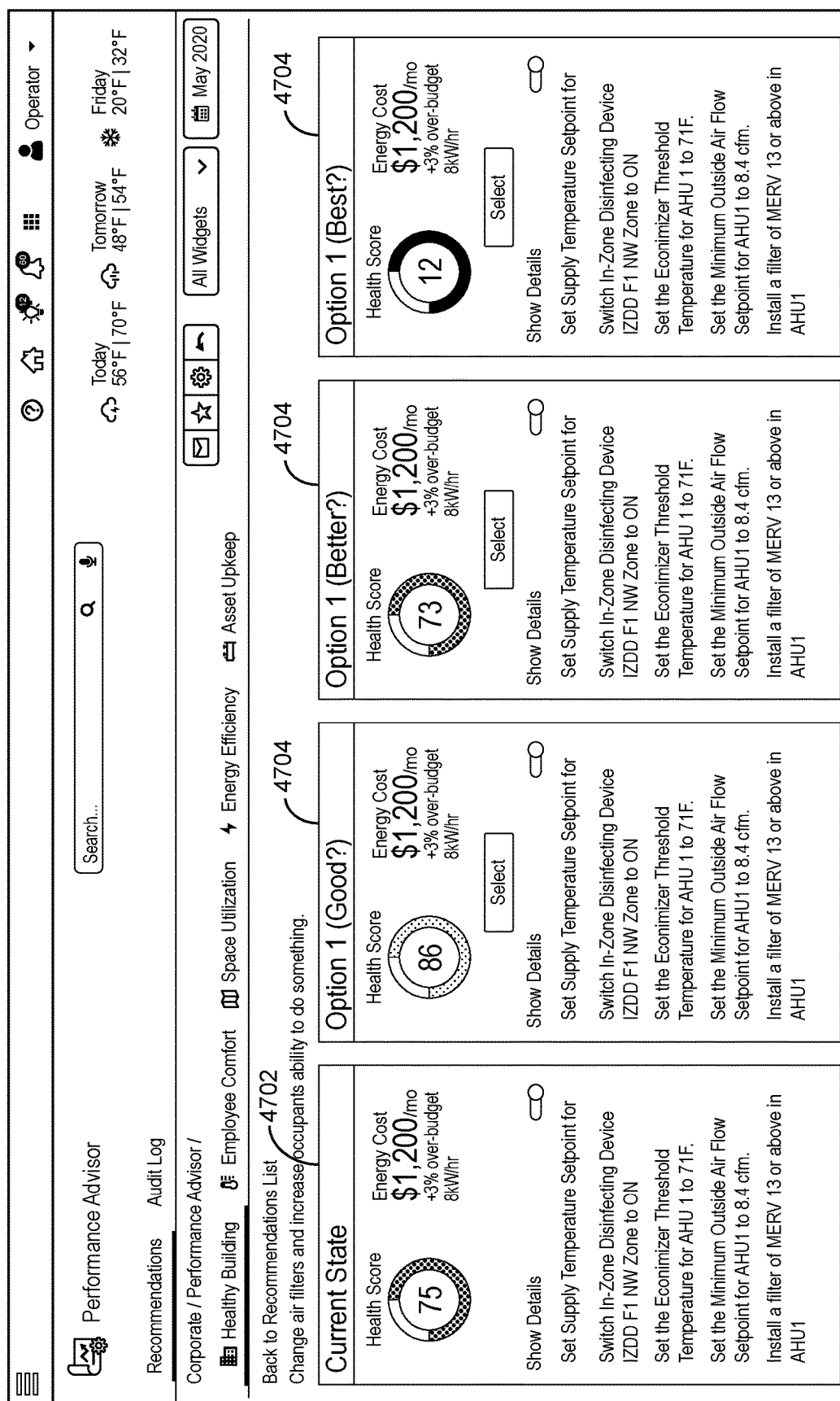
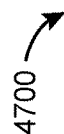


FIG. 47

4800 →

Performance Advisor

Recommendations

Audit Log

Today 56°F | 70°F

Tomorrow 48°F | 54°F

Friday 20°F | 32°F

Operator

All Widgets

May 2020

Energy Efficiency

Space Utilization

Asset Upkeep

Employee Comfort

Corporate / Performance Advisor /

Healthy Building

Employee Comfort

Space Utilization

Asset Upkeep

Energy Efficiency

May 2020

Show Tagged Spaces

Show Tagged Assets

Healthy Building Recommendations

Time	Impact	Category	Space Name	Alert	Recommendations	Basis of Recommendation
26 June 2020 05:30PM	+10	Air	507 Michigan Ave	Poor Air Quality	Change air filters and increase occupants ability to do something	Outdoor air temperatures are higher than usual.
26 June 2020 05:30PM	+2	Space	Building-3> Floor-5> Zone B> Room SE 214	Room SE124 has 3 more occupants than allowed...	Inform the occupants to maintain physical distancing	Refer to physical distancing best practices for enabling employee health and something
26 June 2020 05:30PM	+3	Fitness	Building-3> Floor-5> Zone B> Room SE 214	Room SE124 has 3 more occupants than allowed...	Inform the occupants to maintain physical distancing	Refer to physical distancing best practices for enabling employee health and something
26 June 2020 05:30PM	+5	Mechanical Maintenance	Building-3> Floor-5> Zone B> Room SE 214	Room SE124 has 3 more occupants than allowed...	Inform the occupants to maintain physical distancing	Refer to physical distancing best practices for enabling employee health and something
26 June 2020 05:30PM	+2	Example	Building-3> Floor-5> Zone B> Room SE 214	Room SE124 has 3 more occupants than allowed...	Inform the occupants to maintain physical distancing	Refer to physical distancing best practices for enabling employee health and something
26 June 2020 05:30PM	+1	Example	Building-3> Floor-5> Zone B> Room SE 214	Room SE124 has 3 more occupants than allowed...	Inform the occupants to maintain physical distancing	Refer to physical distancing best practices for enabling employee health and something

Rows per page: 5
 1-5 of 100

FIG. 48

4900

Asset Manager

Search...

🔍

🏠

📱

🔧

👤

Operator

Today
69°F | 59°F

Tomorrow
69°F | 62°F

Thursday
73°F | 68°F

Company > 123 Main Street > Corporate Building Center > Floor 1 > NW Zone

COMMAND & CONTROLS FOR AHU 1

POINTS	COMMAND/STATUS	INDEFINITELY	TIMER FOR COMMAND	TIMER REMAINING	STATUS
☐ Outside Air Temperature	82 °F	☐	00 : 00		
☐ 1 Outside Air Humidity	48.53 %RH	☐	00 : 00		
☐ Occupancy Mode	Unoccupied ▾ sts	☐	00 : 00		
☐ Operation Mode	Enable ▾ sts	☐	00 : 00		
☐ Supply Air Fan Status	0 sts	☐	00 : 00		
☐ Supply Air Fan Command	Off ▾ sts	☐	00 : 00		
☐ Supply Air Fan Output	0 %	☐	00 : 00		
☐ 1 Supply Air Flow	0 CFM	☐	00 : 00		
☐ 1 Supply Air Flow	0 CFM	☐	00 : 00		
☐ Return Air Fan Status	0 sts	☐	00 : 00		
☐ Return Air Fan Command	Off ▾ sts	☐	00 : 00		
☐ Return Air Fan Output	0 %	☐	00 : 00		
☐ Supply Air Pressure Setpoint	0 in wc	☐	00 : 00		
☐ Economizer Mode	Off ▾ sts	☐	00 : 00		
☐ Cooling Output	0 %	☐	00 : 00		
☐ Heating Output	0 %	☐	00 : 00		
☐ Outdoor Air Damper Output	0 %	☐	00 : 00		
☐ Supply Air Temperature Setpoint	77 °F	☐	00 : 00		

Apply

Release All

Reset

FIG. 49

5000 →

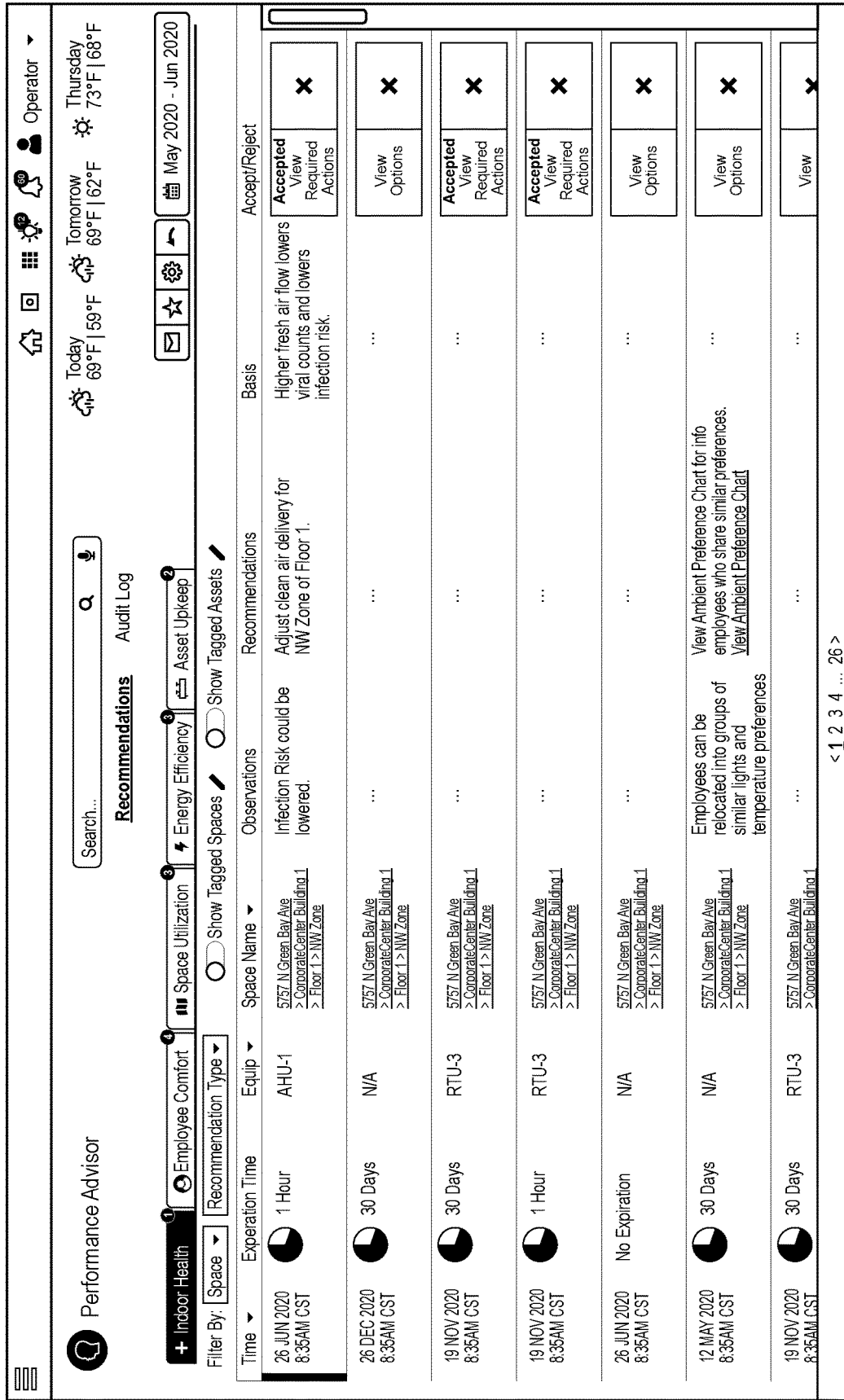


FIG. 50

Performance Advisor

Today 69°F | 59°F Tomorrow 69°F | 62°F Thursday 73°F | 68°F

[Recommendations](#)
[Audit Log](#)

Filter By: Space ▾ Recommendation Type ▾

☐ Show Tagged Spaces

☒ Show Tagged Assets

Time ▾	Category	Equip ▾	Space Name ▾	Observations	Recommendations	Basis of Recommendation	Basis	Accept/Reject	Reject Reason
26 JUN 2020 8:35AM CST	Indoor Health	AHU-1	Building-1 > Floor 1 > Zone A	Employee Corner is predicted to be under occupied between 5:00 PM to 6:00 PM	Suggest to Change the Temperature setpoint to 74°F.	Predicted occupancy based on which appropriate temperature setpoint is recommended.	First Lastname	Accepted View Required Actions X	
19 SEP 2020 8:35AM CST	Indoor Health	RTU-3	Area 1 Vancouver... Roof	...	...	...	First Lastname	View Options	X
19 SEP 2020 8:35AM CST	Indoor Health	RTU-3	Area 1 Vancouver... Roof	...	...	...	First Lastname	View Options	Rejected Reset Actions
19 SEP 2020 8:35AM CST	Asset Upkeep	RTU-3	Area 1 Vancouver... Roof	...	...	...	First Lastname	✓	X
19 SEP 2020 8:35AM CST	Energy Emergency	RTU-3	Area 1 Vancouver... Roof	...	...	...	First Lastname	✓	X
19 SEP 2020 8:35AM CST	Space Utilization	RTU-3	Area 1 Vancouver... Roof	...	...	...	First Lastname	✓	X
19 SEP 2020 8:35AM CST	Asset Unknown	RTU-3	Area 1 Vancouver... Roof	...	...	...	First Lastname	✓	X

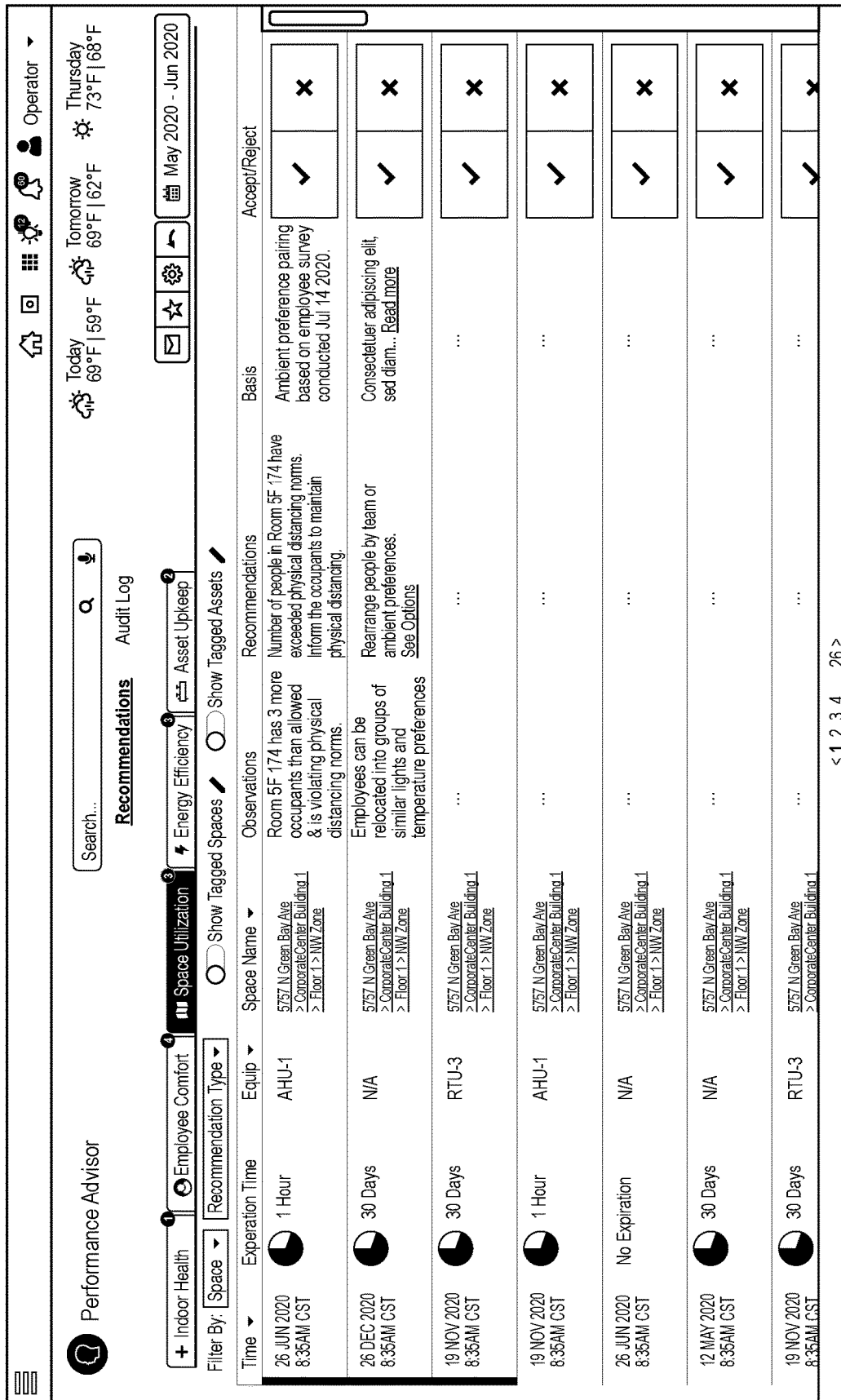
< 1 2 3 4 26 >

FIG. 51

[illegible]

FIG. 52

5300



5400

Performance Advisor

Search...

Today 69°F | 59°F
 Tomorrow 69°F | 62°F
 Thursday 73°F | 68°F

+ Indoor Health
Space ▾

Filter By: Space

Employee Comfort
Recommendation Type ▾

Recommendation Type

Space Utilization
Energy Efficiency

Asset Upkeep

Show Tagged Spaces
Show Tagged Assets

Audit Log

Recommendations

May 2020 - Jun 2020

Time	Expiration Time	Equip	Space Name	Observations	Recommendations	Basis	Accept/Reject
26 JUN 2020 8:35AM CST	1 Hour 	AHU-5	Building 3 > Floor 12 > South Zone	Employee Corner is predicted to be under occupied between 5:00 PM to 6:00 PM.	Suggest to Change the Supply Air Temperature Setpoint to 74 F.	Predicted occupancy based on which appropriate temperature setpoint is recommended.	✓ ✗
26 DEC 2020 8:35AM CST	30 Days 	N/A	5757 N Green Bay Ave > Corporate Center Building 1 > Floor 1 > NW Zone	...	...	...	✓ ✗
19 NOV 2020 8:35AM CST	30 Days 	RTU-3	5757 N Green Bay Ave > Corporate Center Building 1 > Floor 1 > NW Zone	...	...	...	✓ ✗
26 NOV 2020 8:35AM CST	1 Hour 	RTU-3	5757 N Green Bay Ave > Corporate Center Building 1 > Floor 1 > NW Zone	...	...	...	✓ ✗
26 JUN 2020 8:35AM CST	No Expiration	N/A	5757 N Green Bay Ave > Corporate Center Building 1 > Floor 1 > NW Zone	...	...	...	✓ ✗
12 MAY 2020 8:35AM CST	30 Days 	N/A	5757 N Green Bay Ave > Corporate Center Building 1 > Floor 1 > NW Zone	Employees can be relocated into groups of similar lights and temperature preferences	...	...	✓ ✗
19 NOV 2020 8:35AM CST	30 Days 	RTU-3	5757 N Green Bay Ave > Corporate Center Building 1	...	...	...	✓ ✗

[<](#) [1](#) [2](#) [3](#) [4](#) ... [26](#) >

FIG. 54

Home
Grid
Lightbulb
Bell
Operator

Today 69°F | 59°F
Tomorrow 69°F | 62°F
Thursday 73°F | 68°F

Performance Advisor

Audit Log

+ Indoor Health

1 Employee Comfort

2 Space Utilization

3 Energy Efficiency

4 Asset Upkeep

Filter By:

Space

Recommendation Type

Show Tagged Spaces

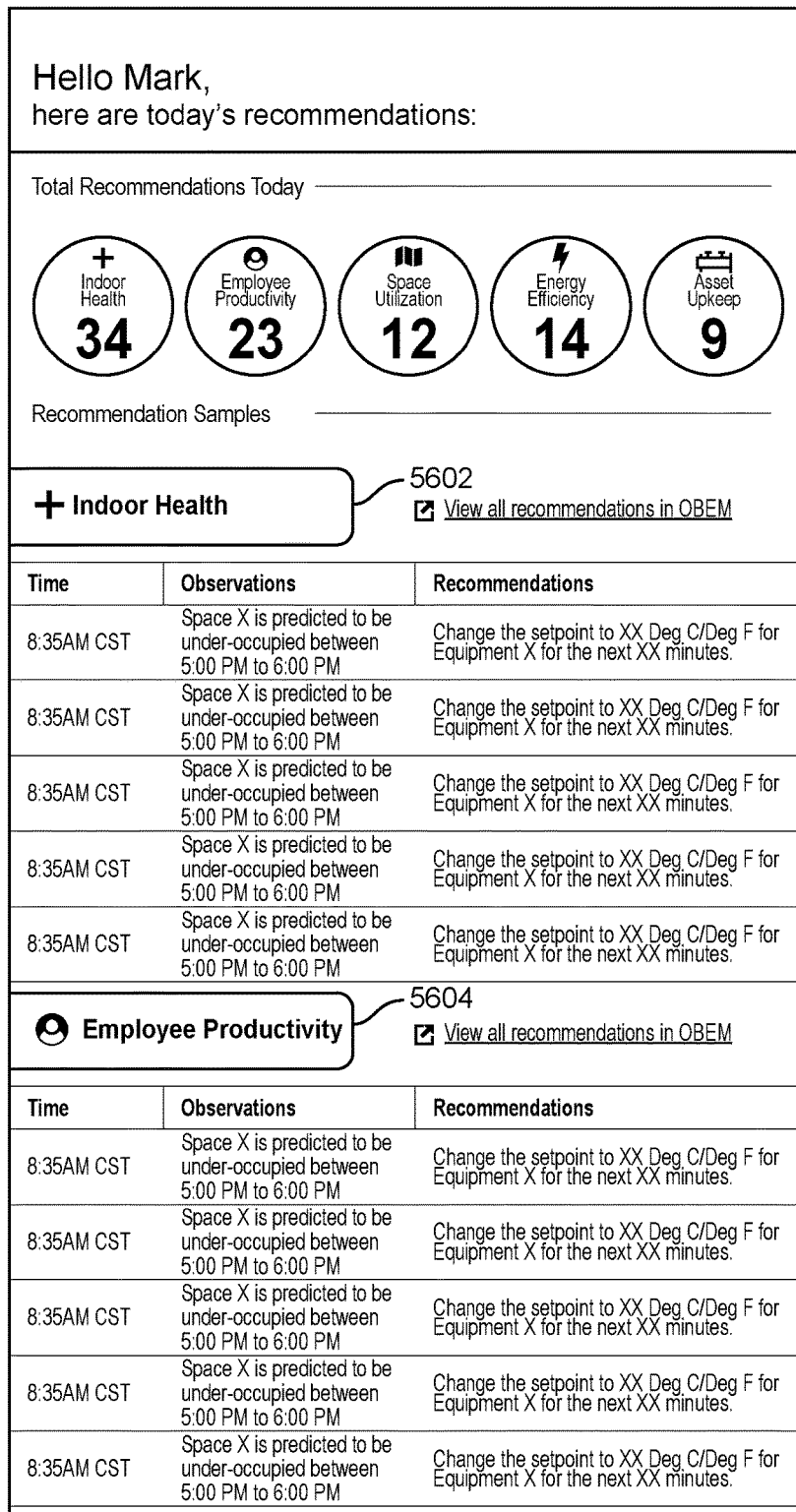
Show Tagged Assets

Time	Expiration Time	Equip	Space Name	Observations	Recommendations	Basis	Accept/Reject
26 JUN 2020 8:35AM CST	1 Hour	RTU-3	Building-3 > Floor-12 > South Zone	Equipment RTU-3 is found to be faulty with excess heat.	These are the probable reasons: 1. Clogged drainage system 2. Fan belt needs replacement Please create a work order for this.	Recommendation based on historical data for similar units.	✓ ✗
26 DEC 2020 8:35AM CST	30 Days	N/A	5757 N Green Bay Ave > CorporateCenter Building.1 > Floor.1 > NW.Zone	...	...	...	✓ ✗
19 NOV 2020 8:35AM CST	30 Days	RTU-3	5757 N Green Bay Ave > CorporateCenter Building.1 > Floor.1 > NW.Zone	...	...	...	✓ ✗
19 NOV 2020 8:35AM CST	1 Hour	RTU-3	5757 N Green Bay Ave > CorporateCenter Building.1 > Floor.1 > NW.Zone	...	...	...	✓ ✗
26 JUN 2020 8:35AM CST	No Expiration	N/A	5757 N Green Bay Ave > CorporateCenter Building.1 > Floor.1 > NW.Zone	...	...	...	✓ ✗
12 MAY 2020 8:35AM CST	30 Days	N/A	5757 N Green Bay Ave > CorporateCenter Building.1 > Floor.1 > NW.Zone	Employees can be relocated into groups of similar lights and temperature preferences	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh. Read more	Consectetur adipiscing elit, sed diam nonummy nibh. Read more	✓ ✗
19 NOV 2020 8:35AM CST	30 Days	RTU-3	5757 N Green Bay Ave > CorporateCenter Building.1	...	...	...	✓ ✗

< 1 2 3 4 ... 26 >

FIG. 55

5600



5602

☒ [View all recommendations in OBEM](#)

5604

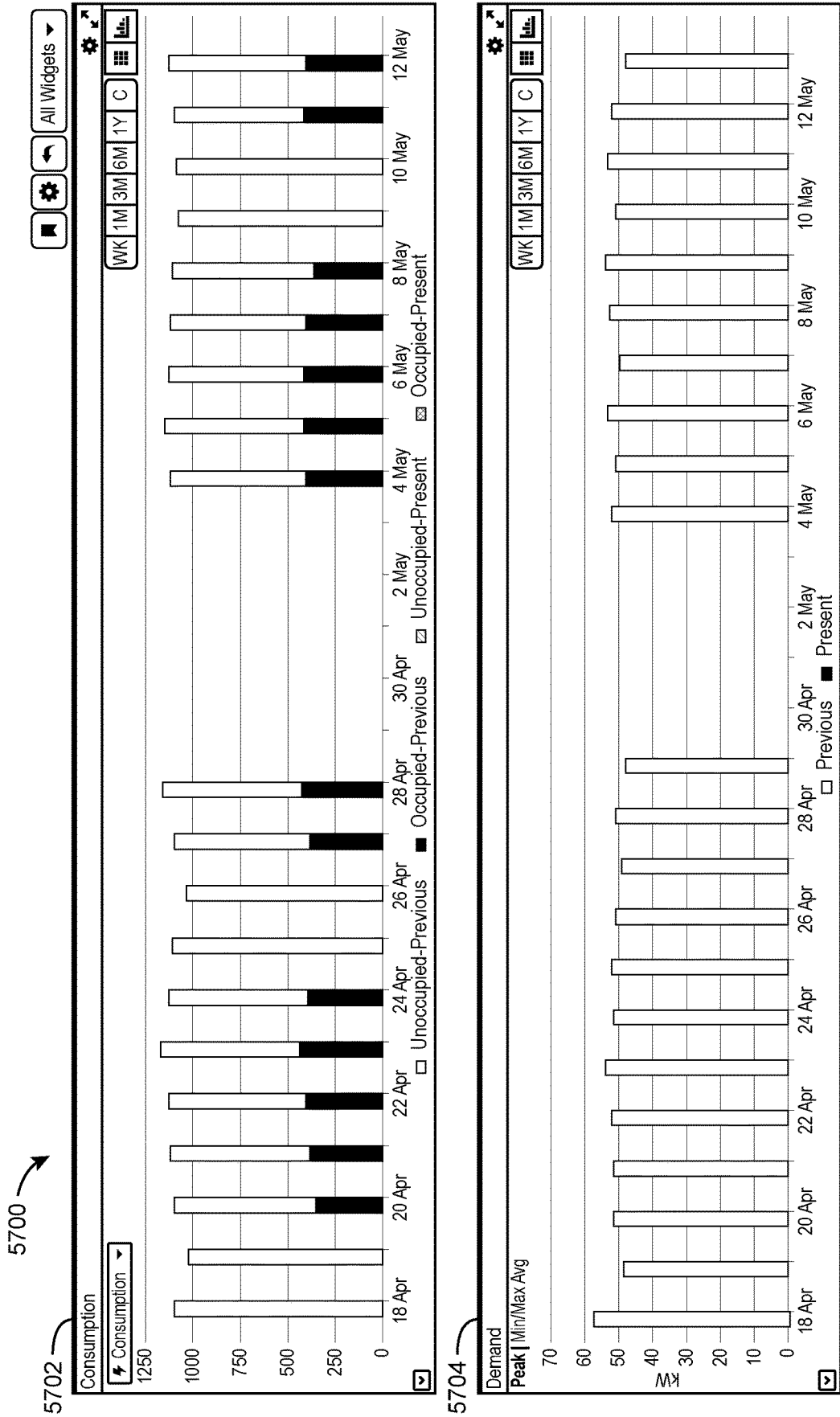
☒ [View all recommendations in OBEM](#)

FIG. 56A

5600

 Space Utilization 5606 ☒ View all recommendations in OBEM		
Time	Observations	Recommendations
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
 Energy Efficiency 5608 ☒ View all recommendations in OBEM		
Time	Observations	Recommendations
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
 Asset Upkeep 5610 ☒ View all recommendations in OBEM		
Time	Observations	Recommendations
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.
8:35AM CST	Space X is predicted to be under-occupied between 5:00 PM to 6:00 PM	Change the setpoint to XX Deg C/Deg F for Equipment X for the next XX minutes.

FIG. 56B



5800 →

Search Results for "XF1"

Energy Manager

Asset Manager

Space Performance

Tenant Manager

Reports

Filter:

☒ Search All

☐ Meters

☐ Spaces

Within Energy Categories:

☐ Electricity

☐ Thermal

☐ Water

☐ Steam

☐ Natural Gas

☐ Hot Water

☐ Chilled Water

▼ ABC Corporation

▼ 123 Main St USA

▼ Building 1

▼ Floor 2

▼ Electricity

▼ 537 XF1 Replica F2

kW

kWh

▼ B1FZ1

Conference XF1

> Floor 5

5802

5702

Consumption

1250

1000

750

500

250

0

18 Apr

20 Apr

22 Apr

24 Apr

26 Apr

28 Apr

30 Apr

2 May

4 May

6 May

8 May

10 May

12 May

Occupied-Previous

Unoccupied-Previous

Occupied-Current

Unoccupied-Current

0 kWh

43.453 kWh

0 MAX KVA

0.00 Min Power Factor

NA % Changes

View in Energy Manager

FIG. 58

BUILDING SYSTEM WITH BUILDING HEALTH RECOMMENDATIONS

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

[0001] This application claims the benefit of and priority to U.S. Provisional Patent Application No. 63/113,019 filed Nov. 12, 2020, Indian Provisional Patent Application No. 202021035549 filed Aug. 18, 2020, and Indian Provisional Patent Application No. 202121004000 filed Jan. 29, 2021, the entirety of each of which is incorporated by reference herein.

BACKGROUND

[0002] The present disclosure relates to building systems of a building. The present disclosure relates more particularly to health of the building.

[0003] In some embodiments, a building includes various building systems that operate to provide environmental control, security, fire response, and various other services for a building. However, based on the operation of the building systems, the performance of building spaces may change based on the operation of the building systems, i.e., whether the building systems are operating correctly or have encountered errors. Users may occupy the spaces of the building. The mental and physical wellbeing of users may be based on the operation of the building systems and/or services offered within the building. Furthermore, the operation of the building systems may affect energy usage and pollution generation, affecting the environment surrounding the building.

SUMMARY

[0004] One implementation of the present disclosure is a building system of a building including one or more storage devices storing instructions thereon that, when executed by one or more processors, cause the one or more processors to receive building data from one or more building systems of the building and generate, based on the building data, an overall building score of the building based on one or more space parameters indicating health levels of spaces of the building, one or more planet health parameters indicating effect of operations performed by the one or more building systems of the building on environmental pollution, and one or more people parameters indicating at least one of physical or mental health of occupants of the building caused by the operation of the one or more building systems. The instructions cause the one or more processors to implement one or more updates to the one or more building systems of the building, the one or more updates updating operation of the building to improve at least one of the one or more space parameters, the one or more planet health parameters, or the one or more people parameters causing the overall building score to improve.

[0005] In some embodiments, the one or more updates include at least one of an update to an operating setting of the one or more building systems controlling an environmental condition of the building, a work order to perform maintenance on the one or more building systems, and an update to add a new system or service to the one or more building systems.

[0006] In some implementations, the one or more space parameters of the building indicating health levels of the spaces of the building include at least one of process health

parameters indicating health of processes performed within the spaces of the building, system health parameters indicating the health of the one or more building systems, and safety and security health parameters indicating health of safety and security systems of the one or more building systems.

[0007] In some embodiments, the instructions cause the one or more processors to determine occupancy levels of spaces of the building at times and generate a user interface including one or more elements indicating the occupancy levels of the spaces and one or more elements indicating occupancy level trends based on the occupancy levels of the spaces of the building at the times.

[0008] In some embodiments, the instructions cause the one or more processors to determine, based on the building data, indoor air quality of indoor air of the building and infectious disease risk indicating a risk level of occupants of the building contracting an infectious disease and cause the user interface to include an indication of the indoor air quality and the infectious disease risk.

[0009] In some embodiments, the instructions cause the one or more processors to determine, based on the building data, one or more space health scores for the one or more space parameters of the building, determine, based on the building data, one or more planet health scores for the one or more planet health parameters of the building, and determine, based on the building data, one or more people health scores for the one or more people parameters of the building.

[0010] In some embodiments, the instructions cause the one or more processors to generate, based on the building data, the overall building score of the building based on the one or more space health scores, the one or more planet health scores, and the one or more people health scores and cause the one or more processors to generate a user interface including an overall building score element include an indication of the overall building score.

[0011] In some embodiments, the user interface includes one or more space health score elements including one or more indications of the one or more space health scores, indications of alerts associated with the one or more space health scores, and indications of one or more recommendations to perform actions to improve the one or more space health scores.

[0012] In some embodiments, the user interface includes one or more planet health score elements including one or more indications of the one or more planet health scores, indications of alerts associated with the one or more planet health scores, and indications of one or more recommendations to perform actions to improve the one or more space planet scores.

[0013] In some embodiments, the user interface includes one or more people health score elements including one or more indications of the one or more people health scores, indications of alerts associated with the one or more people health scores, and indications of one or more recommendations to perform actions to improve the one or more people health scores.

[0014] Another implementation of the present disclosure is a method including receiving, by a processing circuit, building data from one or more building systems of a building and generating, by the processing circuit, based on the building data, an overall building score of the building based on one or more space parameters indicating health

levels of spaces of the building, one or more planet health parameters indicating effect of operations performed by the one or more building systems of the building on environmental pollution, and one or more people parameters indicating at least one of physical or mental health of occupants of the building caused by the operation of the one or more building systems. The method further includes implementing, by the processing circuit, one or more updates to the one or more building systems of the building, the one or more updates updating operation of the building to improve at least one of the one or more space parameters, the one or more planet health parameters, or the one or more people parameters causing the overall building score to improve.

[0015] In some embodiments, the one or more updates include at least one of an update to an operating setting of the one or more building systems controlling an environmental condition of the building, a work order to perform maintenance on the one or more building systems, and an update to add a new system or service to the one or more building systems.

[0016] In some embodiments, the one or more space parameters of the building indicating health levels of the spaces of the building include at least one of process health parameters indicating health of processes performed within the spaces of the building, system health parameters indicating the health of the one or more building systems, and safety and security health parameters indicating health of safety and security systems of the one or more building systems.

[0017] In some embodiments, the method further includes determining, by the processing circuit, based on the building data, one or more space health scores for the one or more space parameters of the building, determining, by the processing circuit, based on the building data, one or more planet health scores for the one or more planet health parameters of the building, and determining, by the processing circuit, based on the building data, one or more people health scores for the one or more people parameters of the building.

[0018] In some embodiments, the method further includes generating, by the processing circuit, based on the building data, the overall building score of the building based on the one or more space health scores, the one or more planet health scores, and the one or more people health scores and generating, by the processing circuit, a user interface including an overall building score element including an indication of the overall building score.

[0019] In some embodiments, the user interface includes one or more space health score elements including one or more indications of the one or more space health scores, indications of alerts associated with the one or more space health scores, and indications of one or more recommendations to perform actions to improve the one or more space health scores.

[0020] In some embodiments, the user interface includes one or more planet health score elements including one or more indications of the one or more planet health scores, indications of alerts associated with the one or more planet health scores, and indications of one or more recommendations to perform actions to improve the one or more planet health scores.

[0021] In some embodiments, the user interface includes one or more people health score elements including one or more indications of the one or more people health scores,

indications of alerts associated with the one or more people health scores, and indications of one or more recommendations to perform actions to improve the one or more people health scores.

[0022] Another implementation of the present disclosure is a building health analysis system of a building including one or more storage devices storing instructions thereon and one or more processors configured to execute the instructions causing the one or more processors to receive building data from one or more building systems of the building. The instructions cause the one or more processors to generate, based on the building data, an overall building score of the building based on one or more space parameters indicating health levels of spaces of the building, one or more planet health parameters indicating effect of operations performed by the one or more building systems of the building on environmental pollution, and one or more people parameters indicating at least one of physical or mental health of occupants of the building caused by the operation of the one or more building systems. The instructions cause the one or more processors to implement one or more updates to the one or more building systems of the building, the one or more updates updating operation of the building to improve at least one of the one or more space parameters, the one or more planet health parameters, or the one or more people parameters causing the overall building score to improve.

[0023] In some embodiments, the one or more space parameters of the building indicating health levels of the spaces of the building include at least one of process health parameters indicating health of processes performed within the spaces of the building, system health parameters indicating the health of the one or more building systems, and safety and security health parameters indicating health of safety and security systems of the one or more building systems.

[0024] One implementation of the present disclosure is a building system of a building including one or more storage devices storing instructions thereon that, when executed by one or more processors, cause the one or more processors to receive building data from one or more building systems of the building and cause a display device of a user device of a user to display, based on the building data, one or more building scores of the building based on at least one of one or more space parameters indicating health levels of spaces of the building, one or more planet health parameters relating to an effect of the building on environmental pollution, or one or more people parameters relating to at least one of physical or mental health of occupants of the building. The instructions cause the one or more processors to generate one or more recommendations for improving the one or more building scores, the one or more recommendations including a prediction of an increase to a level of the one or more building scores or a decrease to the level of the one or more building scores, cause the display device of the user device of the user to display the one or more recommendations and receive, via the display device, a selection of one recommendation of the one or more recommendations via the display device from the user, and operate the one or more building systems based on one or more operating settings of the one recommendation.

[0025] In some embodiments, the instructions cause the one or more processors to receive second building data resulting from operation of the one or more building systems based on the one or more operating settings of the one

recommendation, generate one or more second building scores with the second building data based on the at least one of one or more space parameters indicating the health levels of spaces of the building, the one or more planet health parameters relating to the effect of the building on environmental pollution, or the one or more people parameters relating to the at least one of physical or mental health of occupants of the building, and cause the display device to display the one or more second building scores.

[0026] In some embodiments, the instructions cause the one or more processors to determine one or more monthly financial costs resulting from energy consumption resulting from operating the one or more building systems based on the one or more recommendations and cause the display device to display the one or more monthly financial costs.

[0027] In some embodiments, the instructions cause the one or more processors to generate a user interface including the one or more recommendations, one or more monthly financial costs resulting from energy consumption resulting from the one or more recommendations, and particular operating settings for the one or more recommendations and a current operating state of the building, a current monthly financial cost, and one or more current operating settings. In some embodiments, the instructions cause the one or more processors to cause the display device to display the user interface.

[0028] In some embodiments, the one or more recommendations include a first recommendation and a second recommendation. In some embodiments, the first recommendation includes one or more first proposed settings for the one or more operating settings. In some embodiments, the second recommendation includes one or more second proposed settings for the one or more operating settings.

[0029] In some embodiments, the instructions cause the one or more processors to generate a people health score with the building data based on the one or more people parameters relating to the at least one of physical or mental health of occupants of the building and generate a space health score with the building data based on the one or more space parameters indicating the health levels of spaces of the building. In some embodiments, the instructions cause the one or more processors to generate a planet health score with the building data based on the one or more planet health parameters relating to the effect of the building on environmental pollution and generate an overall health score based on the people health score, the space health score, and the planet health score. In some embodiments, the instructions cause the one or more processors to generate a home screen including the people health score, the space health score, the planet health score, and the overall health score and cause the display device to display the home screen.

[0030] In some embodiments, the instructions cause the one or more processors to generate a trend element, the trend element including a trend of at least one of the people health score, the space health score, the planet health score, or the overall health score over a time period and cause the home screen to include the trend element.

[0031] In some embodiments, the instructions cause the one or more processors to generate a list of buildings based on a specific overall health score for each of buildings, the list of buildings listing the buildings from lowest overall health score to highest overall health score and cause the home screen to include the list of buildings.

[0032] In some embodiments, the instructions cause the one or more processors to identify alerts indicating issues occurring at the building, the alerts impacting the overall health score by a particular amount and reducing the overall health score and cause the home screen to include the alerts and the particular amount impacting the overall health score.

[0033] In some embodiments, the instructions cause the one or more processors to receive a first selection, via the user device, of a first element associated with the people health score, cause the display device to display sub-scores of the people health score in response to receiving the first selection, wherein the people health score is based on the sub-scores of the people health score, and receive a second selection, via the user device, of a second element associated with the space health score. In some embodiments, the instructions cause the one or more processors to cause the display device to display sub-scores of the space health score in response to receiving the second selection, wherein the space health score is based on the sub-scores of the space health score, receive a third selection, via the user device, of a third element associated with the planet health score, and cause the display device to display sub-scores of the planet health score in response to receiving the second selection, wherein the planet health score is based on the sub-scores of the planet health score.

[0034] Another implementation of the present disclosure is a method including receiving, by a processing circuit, building data from one or more building systems of a building and causing, by the processing circuit, a display device of a user device of a user to display, based on the building data, one or more building scores of the building based on at least one of one or more space parameters indicating health levels of spaces of the building, one or more planet health parameters relating to an effect of the building on environmental pollution, or one or more people parameters relating to at least one of physical or mental health of occupants of the building. In some embodiments, the method includes generating, by the processing circuit, one or more recommendations for improving the one or more building scores, the one or more recommendations including a prediction of an increase to a level of the one or more building scores or a decrease to the level of the one or more building scores, causing, by the processing circuit, the display device of the user device of the user to display the one or more recommendations and receive, via the display device, a selection of one recommendation of the one or more recommendations via the display device from the user, and operating, by the processing circuit, the one or more building systems based on one or more operating settings of the one recommendation.

[0035] In some embodiments, the method includes receiving, by the processing circuit, second building data resulting from operation of the one or more building systems based on the one or more operating settings of the one recommendation, generating, by the processing circuit, one or more second building scores with the second building data based on the at least one of one or more space parameters indicating the health levels of spaces of the building, the one or more planet health parameters relating to the effect of the building on environmental pollution, or the one or more people parameters relating to the at least one of physical or mental health of occupants of the building, and causing, by the processing circuit, the display device to display the one or more second building scores.

[0036] In some embodiments, the method includes determining, by the processing circuit, one or more monthly financial costs resulting from energy consumption resulting from operating the one or more building systems based on the one or more recommendations and causing, by the processing circuit, the display device to display the one or more monthly financial costs.

[0037] In some embodiments, the method includes generating, by the processing circuit, a user interface including the one or more recommendations, one or more monthly financial costs resulting from energy consumption resulting from the one or more recommendations, and particular operating settings for the one or more recommendations and a current operating state of the building, a current monthly financial cost, and one or more current operating settings and causing, by the processing circuit, the display device to display the user interface.

[0038] In some embodiments, the one or more recommendations include a first recommendation and a second recommendation. In some embodiments, the first recommendation includes one or more first proposed settings for the one or more operating settings. In some embodiments, the second recommendation includes one or more second proposed settings for the one or more operating settings.

[0039] In some embodiments, the method includes generating, by the processing circuit, a people health score with the building data based on the one or more people parameters relating to the at least one of physical or mental health of occupants of the building, generating, by the processing circuit, a space health score with the building data based on the one or more space parameters indicating the health levels of spaces of the building, and generating, by the processing circuit, a planet health score with the building data based on the one or more planet health parameters relating to the effect of the building on environmental pollution. In some embodiments, the method includes generating, by the processing circuit, an overall health score based on the people health score, the space health score, and the planet health score, generating, by the processing circuit, a home screen including the people health score, the space health score, the planet health score, and the overall health score, and causing, by the processing circuit, the display device to display the home screen.

[0040] In some embodiments, the method includes generating, by the processing circuit, a trend element, the trend element including a trend of at least one of the people health score, the space health score, the planet health score, or the overall health score over a time period and causing, by the processing circuit, the home screen to include the trend element.

[0041] In some embodiments, the method includes generating, by the processing circuit, a list of buildings based on a specific overall health score for each of buildings, the list of buildings listing the buildings from lowest overall health score to highest overall health score and causing, by the processing circuit, the home screen to include the list of buildings.

[0042] In some embodiments, the method includes identifying, by the processing circuit, alerts indicating issues occurring at the building, the alerts impacting the overall health score by a particular amount and reducing the overall health score and causing, by the processing circuit, the home screen to include the alerts and the particular amount impacting the overall health score.

[0043] Another implementation of the present disclosure is a building system of a building including one or more storage devices storing instructions thereon and one or more processors configured to execute the instructions that cause the one or more processors to receive building data from one or more building systems of the building and cause a display device of a user device of a user to display, based on the building data, one or more building scores of the building based on at least one of one or more space parameters indicating health levels of spaces of the building, one or more planet health parameters relating to an effect of the building on environmental pollution, or one or more people parameters relating to at least one of physical or mental health of occupants of the building. The instructions cause the one or more processors to generate one or more recommendations for improving the one or more building scores, the one or more recommendations including a prediction of an increase to a level of the one or more building scores or a decrease to the level of the one or more building scores, cause the display device of the user device of the user to display the one or more recommendations and receive, via the display device, a selection of one recommendation of the one or more recommendations via the display device from the user, and operate the one or more building systems based on one or more operating settings of the one recommendation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0044] Various objects, aspects, features, and advantages of the disclosure will become more apparent and better understood by referring to the detailed description taken in conjunction with the accompanying drawings, in which like reference characters identify corresponding elements throughout. In the drawings, like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements.

[0045] FIG. 1 is a block diagram of a system including building systems, cloud systems, and user systems including a building health manager for managing building health, according to an exemplary embodiment.

[0046] FIG. 2 is a block diagram of the building health manager in greater detail, according to an exemplary embodiment.

[0047] FIG. 3 is a Venn diagram of planet health parameters, space health parameters, and people health parameters contributing to an overall building health score, according to an exemplary embodiment.

[0048] FIG. 4 is a schematic drawing of process health parameters, resource health and sustainability parameters, occupancy health and wellness parameters, safety and security health parameters, and system health parameters, according to an exemplary embodiment.

[0049] FIG. 5A is a schematic drawing of the health parameters of FIG. 4 shown in a building, according to an exemplary embodiment.

[0050] FIG. 5B-5D are schematic drawings of the building of FIG. 5A where an artificial intelligence performs a mode selection for balancing the health parameters, according to an exemplary embodiment.

[0051] FIG. 6 is a schematic drawing of occupant health and wellness parameters, according to an exemplary embodiment.

[0052] FIG. 7 is a schematic drawing of safety and security health parameters, according to an exemplary embodiment.

[0053] FIG. 8 is a schematic drawing of system health parameters, according to an exemplary embodiment.

[0054] FIG. 9 is a schematic drawing of process health parameters, according to an exemplary embodiment.

[0055] FIG. 10 is a schematic drawing of resource health and sustainability parameters, according to an exemplary embodiment.

[0056] FIG. 11 is a block diagram of the building health manager generating an overall building score from space health scores, planet health scores, and people health scores, according to an exemplary embodiment.

[0057] FIG. 12 is a flow diagram of a process of generating the overall building score from the space health scores, the planet health scores, and the people health scores, according to an exemplary embodiment.

[0058] FIG. 13 is a building management interface, according to an exemplary embodiment.

[0059] FIG. 14 is a building health interface, according to an exemplary embodiment.

[0060] FIG. 15 is an occupant health interface, according to an exemplary embodiment.

[0061] FIG. 16A is a space performance user interface including infection risk and air quality information, according to an exemplary embodiment.

[0062] FIG. 16B is another space performance user interface including infection risk and air quality information, according to an exemplary embodiment.

[0063] FIG. 16C is a user interface providing recommendations for a user to select from that affect an infectious disease risk score, according to an exemplary embodiment.

[0064] FIG. 16D is a user interface including optional adjustments for one of the recommendations of the interface of FIG. 16C, according to an exemplary embodiment.

[0065] FIG. 16E is a user interface including accepted operational adjustments for the one recommendation of FIG. 16D, according to an exemplary embodiment.

[0066] FIG. 16F is a user interface including optional adjustments for another one of the recommendations of the interface of FIG. 16C, according to an exemplary embodiment.

[0067] FIG. 16G is a user interface including recommendations where a first recommendation needs to be reset before a second recommendation can be accepted, according to an exemplary embodiment.

[0068] FIGS. 17-18A-B is the space performance user interface of FIGS. 16A-B including space utilization information, according to an exemplary embodiment.

[0069] FIG. 19 is a table of air quality parameter scoring, according to an exemplary embodiment.

[0070] FIG. 20 is a table of thermal comfort parameter scoring, according to an exemplary embodiment.

[0071] FIG. 21 is a table of light parameter scoring, according to an exemplary embodiment.

[0072] FIG. 22 is a table of light sunshade parameter scoring, according to an exemplary embodiment.

[0073] FIG. 23 is a table of occupancy parameter scoring, according to an exemplary embodiment.

[0074] FIG. 24 is a table of healthy building parameter scoring, according to an exemplary embodiment.

[0075] FIG. 25 is a table of sound parameter scoring, according to an exemplary embodiment.

[0076] FIG. 26 is a table of sanitization parameter scoring, according to an exemplary embodiment.

[0077] FIG. 27 is a table of food parameter scoring, according to an exemplary embodiment.

[0078] FIG. 28 is a table of fitness parameter scoring, according to an exemplary embodiment.

[0079] FIG. 29 is a table of handwashing parameter scoring, according to an exemplary embodiment.

[0080] FIG. 30 is a table of water quality parameter scoring, according to an exemplary embodiment.

[0081] FIG. 31 is a table of pest control parameter scoring, according to an exemplary embodiment.

[0082] FIG. 32 is a table of emergency parameter scoring, according to an exemplary embodiment.

[0083] FIG. 33 is a table of accessibility parameter scoring, according to an exemplary embodiment.

[0084] FIG. 34 is a table of mind parameter scoring, according to an exemplary embodiment.

[0085] FIG. 35 is a table of social parameter scoring, according to an exemplary embodiment.

[0086] FIG. 36 is a table of physical user health parameter scoring, according to an exemplary embodiment.

[0087] FIG. 37 is a block diagram of the building health manager generating user interface recommendations, according to an exemplary embodiment.

[0088] FIG. 38 is a block diagram of a process of generating user interface recommendations, according to an exemplary embodiment.

[0089] FIG. 39 is a schematic drawing of a building health interface for a group of buildings, according to an exemplary embodiment.

[0090] FIG. 40 is a schematic drawing of a building health interface for one building of the group of buildings of FIG. 39, according to an exemplary embodiment.

[0091] FIG. 41 is a schematic drawing of people health information interface of the one building of the group of buildings of FIG. 40, according to an exemplary embodiment.

[0092] FIG. 42 is a process of closed-loop operation for implementing recommendations based on health scores of the user interfaces of FIGS. 43-46, according to an exemplary embodiment.

[0093] FIG. 43 is a schematic drawing of the building health interface of FIG. 40 where a user selects an air quality alert with an associated recommendation, according to an exemplary embodiment.

[0094] FIG. 44 is a schematic drawing of an interface showing air quality information displayed responsive to selecting the air quality alert of FIG. 43, according to an exemplary embodiment.

[0095] FIGS. 45A-B is a schematic drawing of an interface showing infectious disease related risk information and recommendations, according to an exemplary embodiment.

[0096] FIGS. 46A-B is a schematic drawing of an interface including recommendations addressing infectious disease transmission risk, according to an exemplary embodiment.

[0097] FIG. 47 is a schematic drawing of an interface including recommendations for improving user health scores, according to an exemplary embodiment.

[0098] FIG. 48 is a schematic drawing of an interface including a list of building health recommendations, according to an exemplary embodiment.

[0099] FIG. 49 is a command and control interface where a user can input operating settings for building equipment, according to an exemplary embodiment.

[0100] FIG. 50 is a user interface including recommendations relating to indoor health, according to an exemplary embodiment.

[0101] FIG. 51 is a user interface of an audit log of recommendations of the user interface of FIG. 50, according to an exemplary embodiment.

[0102] FIG. 52 is a user interface including recommendations relating to occupant comfort, according to an exemplary embodiment.

[0103] FIG. 53 is a user interface including recommendations relating to space utilization, according to an exemplary embodiment.

[0104] FIG. 54 is a user interface including recommendations relating to energy efficiency, according to an exemplary embodiment.

[0105] FIG. 55 is a user interface including recommendations relating to asset upkeep, according to an exemplary embodiment.

[0106] FIGS. 56A-B is a user interface including indoor health recommendations, employee productivity recommendations, space utilization recommendations, energy efficiency recommendations, and asset upkeep recommendations, according to an exemplary embodiment.

[0107] FIG. 57 is a user interface with a plot of consumption and demand of a building, according to an exemplary embodiment.

[0108] FIG. 58 is a user interface indicating energy consumption for a space that a user searches for, according to an exemplary embodiment.

DETAILED DESCRIPTION

Overview

[0109] Referring generally to the FIGURES, systems and methods for building health analysis are shown, according to an exemplary embodiment. A building system can perform a building health analysis to determine an overall building health score for a building and/or building facility, in some embodiments. The overall building health score can be based on factors that affect the health of spaces within the building, people within the building, and environmental conditions of the planet.

[0110] By incorporating the health of spaces, people, and the planet into a single score, a high level conclusion of the performance of the building can be reached. If the parameters are considered by the building system individually, the building system may be biased towards that parameter since the other parameters may be ignored. For example, if person health is considered exclusively, excess pollution could be created by the building negatively affecting the planet. Therefore, a composite score considering parameters for spaces, people, and the planet can be generated and used by the building system to operate the building.

[0111] In some embodiments, the building system determines individual scores for various parameters related to building health, user health, and planet health. The building system can generate user interfaces to display the various scores for the various building health parameters, user health parameters, and/or planet health parameters. Furthermore, the user interfaces can include overall building health scores

generated by the building system from the building health parameters, the user health parameters, and/or the planet health parameters.

[0112] In some embodiments, the user interface can highlight issues causing the various scores shown in the user interface to be low, below particular values. The building system can, in some embodiments, analyze the building data to determine recommendations to raise the various scores. The recommendations can, in some implementations, be user actions that the user can perform or authorize the building system to perform the actions. In some embodiments, the building system is configured to take automatic actions to improve the score(s).

[0113] In some embodiments, the recommendations may impact multiple health scores, e.g., planet health scores, people health scores, and space health scores. The recommendation can indicate whether each health score is impacted positively or negatively by the recommendation. For example, increasing air circulation in order to increase space sanitization for people health may increase people health scores but cause the building to consume additional energy, reducing the sustainability score for planet health. In addition, there may be a monetary cost that could be calculated by the building system for recommendations. The cost could be displayed within the recommendations. Recommendations with impact indications and cost would be valuable for building personnel to decide whether to implement recommendations.

[0114] In some embodiments, the building system is configured to optimize multiple health parameters in a building in order to achieve the best and/or a balanced set of parameters for health of people, places, and planet scores. For example, the building system could be configured to optimize air temperatures, clean air conditions, efficient use of energy resources, efficient cleaning and sanitization processes, reliable system performance, and/or facility security. The optimization performed by the building system could make it easy for facility managers to select building operating modes that automatically optimize multiple building health parameters to achieve appropriate outcomes rather than achieving some outcomes but sacrificing others. Using artificial intelligence (AI) and digital twin technologies, the building system can be configured to create an autonomously controlled healthy building that operates to optimize occupant health, space health, and/or planet health and/or provide recommendations to prioritize some parameters over others.

[0115] By tracking health scores of a building, the building system can identify performance issues and automatically, or through user action, perform operations to improve health score(s) of a building. For example, the building system can operate to make sure that a building has appropriate Wi-Fi coverage and reliable network bandwidth. Furthermore, the building system can operate to improve air quality and water quality. In some embodiments, the building system operates to efficiently consume resources such as water and electricity. In some embodiments, the building system can operate to reduce equipment system faults.

[0116] In some embodiments, the building system can operate to maintain building equipment by scheduling maintenance and inspection. In some embodiments, the building system can operate to verify that cleaning is scheduled for cleaning staff at appropriate times. This application is related to U.S. Provisional Application No. 63/113,019 filed Nov.

12, 2020 and Indian Provisional Patent Application No. 202021035549 Aug. 18, 2020. The entirety of each of these patent applications is incorporated by reference herein.

[0117] Referring now to FIG. 1, a system 100 including building systems, cloud systems, and user systems including a building health manager for managing building health, according to an exemplary embodiment. The system 100 includes an edge platform 106, cloud systems 104, user systems 102, and/or external systems 144 (e.g., wellness systems 136, monetary analyzer 140, and/or a risk manager 138). The edge platform 106, the cloud systems 104, and/or the user systems 102 include processors 110-114 and/or memory devices 116-120.

[0118] The processors 110-114 and/or memory devices 116-120 can be devices of one or multiple servers, computer systems, cloud systems, etc. The processors 110-114 can be general purpose or specific purpose processors, application specific integrated circuits (ASICs), one or more field programmable gate arrays (FPGAs), a group of processing components, and/or other suitable processing component. The processors 110-114 may be configured to execute computer code and/or instructions stored in the memory devices 116-120 or received from other computer readable media (e.g., CDROM, network storage, a remote server, etc.).

[0119] The memory devices 116-120 can include one or more devices (e.g., memory units, memory devices, storage devices, etc.) for storing data and/or computer code for completing and/or facilitating the various processes described in the present disclosure. The memory devices 116-120 can include random access memory (RAM), read-only memory (ROM), hard drive storage, temporary storage, non-volatile memory, flash memory, optical memory, or any other suitable memory for storing software objects and/or computer instructions. The memory devices 116-120 can include database components, object code components, script components, or any other type of information structure for supporting the various activities and information structures described in the present disclosure. The memory devices 116-120 can be communicably connected to the processors 110-114 and can include computer code for executing (e.g., by the processors) one or more of the processors 110-114 described herein.

[0120] The cloud systems 104 includes a twin manager 130 and a cloud platform 132. The twin manager 130, the cloud platform 132, and/or the edge platform 106 can be the same as, or similar to, the components described U.S. patent application Ser. No. 17/134,671 filed Dec. 28, 2020, the entirety of which is incorporated by reference herein. The cloud systems 104 further include a building health manager 128. The edge platform 106 can be configured to integrate with building systems 142 to receive building data and provide the building data to the cloud systems 104. Furthermore, the cloud platform 132 can facilitate routing of the building data and/or enrichment of the building data based on a digital twin of a building managed by the twin manager 130. In some embodiments, the building systems 142 are environmental control systems, lighting systems, security systems, fire response systems, and/or any other type of building system.

[0121] The building health manager 128 can be configured to generate health scores for parameters such as planet health parameters, people health parameters, and/or space health parameters. Furthermore, the building health manager 128 can be configured to generate an overall health score

from the scores for the planet health parameters, people health parameters, and/or space health parameters. The building health manager 128 can receive data from the building systems 142 and generate the scores for the planet health parameters, people health parameters, and/or space health parameters. The building health manager 128 can generate a building automation system (BAS) performance index, a light management system (LMS) performance index, a shade performance index, etc.

[0122] The building health manager 128 can receive building data from the building systems 142 and/or the external systems 144 for determining person health scores. The building data can include temperature, humidity, indoor air quality (IAQ), building lighting information, building sunshade information, seating information, sanitization information, emergency information, dining options, social distancing information, thermal control data, occupancy data, mental health data, social event data, etc. The building health manager 128 can determine occupant health scores for occupants and/or perform one or more control operations to improve the person health scores. For example, the building health manager 128 can determine and/or update control values for temperature, humidity, IAQ, light, and/or sunshade to improve person health scores.

[0123] The building health manager 128 can generate scores for system health of a building 146. The system health scores for building management systems (BMS), light management systems (LMS), sunshade systems, electrical metering and fire alarm systems, accessibility, transportation systems, parking management systems, power generation, access control systems, recycling systems, etc. Furthermore, the building health manager 128 can generate safety and security system health scores based on hardware point data, cyber security data (e.g., network cyber security data, Wi-Fi security data, firewall and/or port blocking data, antivirus data, etc.), fire alarm and suppression system data, electrical system data, water leak detection data, fire suppression system data, sprinkler system data, smoke detection data, staircase pressurization system data, evacuation system data, etc. Furthermore, the building health manager 128 can determine resource health scores for electrical usage, gas usage, and/or water usage (e.g., chilled or heated water usage) based on meter data received from the building systems 142.

[0124] The building health manager 128 can receive security system data from CCTVs, intrusion systems, glass-break systems, number plate recognition systems, evacuation system data, facial recognition systems, biometric reader systems. Furthermore, the building health manager 128 can be configured to generate service health scores indicating mechanical, electrical, sound systems, chemical systems, life safety, and transportation system, and/or plumbing system service.

[0125] In some embodiments, the building data received from the edge platform 106 is ingested and stored in a digital twin of the building 146 managed by the twin manager 130. The digital twin can be the digital twin described in U.S. patent application Ser. No. 17/134,671 filed Dec. 28, 2020. The digital twin can be a graph including edges and nodes representing the entities of the building 146 (e.g., the building 146, spaces of the building 146, devices, users, systems, etc.) and relationships between the entities. In some embodiments, the digital twin can store health data of the building 146 used by the building health manager 128 to generate the

planet health scores, space health scores, people health scores, and/or overall building scores. The digital twin can store health related metadata descriptions for points, devices, systems, equipment, spaces, buildings, etc. The digital twin can, in some embodiments, store health scores for the entities of the digital twin, e.g., health scores for buildings, spaces, people, etc.

[0126] In some embodiments, the building health manager 128 can be configured to search and filter health criteria for displaying health information and scores on a user device 148. Furthermore, various building control operations, e.g., calculations, logic, workflows, automation, machine learning, artificial intelligence, etc. that the building health manager 128 may execute to control the building systems 142, can all incorporate health scores for inputs and outputs of the building control operations. In this regard, the building control operations may execute to account for health and improve health scores. For example, a machine learning algorithm that determines setpoints to use in a zone based on predicted occupancy can incorporate health scores into the setpoint optimization to determine setpoints that result in ideal health scores.

[0127] The cloud systems 104 are configured to receive health data from the various external systems 144. The health data received from the external systems 144 can be used by the building health manager 128 to determine health scores. For example, the cloud systems 104 can connect with other external systems 144 managed and/or owned by the same or a different entity, e.g., partner systems. The wellness systems 136 can provide information on the mental, emotional, and/or physical health of occupants of the building 146. The risk manager 138 can provide risk related data for the building 146, the building systems 142 of the building 146 and/or occupants of the building 146. For example, the risk manager 138 can provide risk scores to the cloud systems 104. The risk manager 138 can be the systems described in U.S. application Ser. No. 16/143,221 filed Sep. 26, 2018, the entirety of which is incorporated by reference herein. The external systems 144 further include a monetary analyzer 140. The monetary analyzer 140 can be configured to perform monetization optimizations and/or provide expense reports of the building 146 to the cloud systems 104 based on the operation of the building systems 142.

[0128] The system 100 includes a user device 148. The user device 148 can be any device that provides information to a user and receives input from the user. The user device can include various input and/or output devices, e.g., a keyboard, a mouse, a touch screen, a microphone, a speaker, a display, etc. The user device 148 can be a smartphone, a tablet, a laptop, a desktop computer, a console, a smart television, etc.

[0129] The user systems 102 can manage user interfaces displayed on the user device 148. The user systems 102 can generate the user interfaces and cause the user device 148 to display the user interfaces. In some embodiments, the user systems 102 can be configured to provide input to the user systems 102 via the user interfaces. The user systems 102 include an enterprise manager 122, a companion manager 124, and a security manager 126. The user interfaces may be the user interfaces shown and described with reference to FIGS. 13-18, 37, and 38.

[0130] The enterprise manager 122 can generate one or more interfaces that provide visibility to building health aspects with health scores, descriptions, trends, insights,

and/or actionable recommendations. The enterprise manager 122 can provide easy, intuitive navigation and drill down for rollups of health data to organize detailed information related to concepts and scores. Furthermore, the interfaces can include progress reports.

[0131] The companion manager 124 can provide occupant health information in user interfaces. The occupant health information can include feedback on clean, comfortable spaces (e.g., air, water, light, sanitization, etc.), social distancing and connectivity information, productivity measures, nourishment and fitness goals, reward points, etc. Furthermore, the companion manager 124 can provide user interfaces including health information for spaces. The information can include systems availability and/or provide feedback on janitorial services. Furthermore, the companion manager 124 can provide planet health information. For example, the interface can include responsibility and conversation information, corporate sustainability progress and success, nature information, and/or reward points.

[0132] The security manager 126 can provide security information via user interfaces for security professionals. The information can include health for spaces (e.g., places within a building), safety and security risk information, process and actionable recommendations for improving health and/or risk, etc.

[0133] In some embodiments, the cloud systems 104 can receive data from the building systems 142 and/or the external systems 144. The building health manager 128 can generate health scores based on the data. The data can include space equipment relationships, time series data for temperature, humidity, pressure, IAQ, velocity, light and sunshade data. In some embodiments, the building health manager 128 can be configured to generate thermal, air, and/or light health scores based on the data. Furthermore, based on the data, the health manager 128 can perform HVAC, light, and/or sunshade command and/or control. In some embodiments, the cloud systems 104 can manage a pest administration portal to review and schedule pest control for the building 146.

[0134] In some embodiments, the building health manager 128 can be configured to receive mechanical and/or electrical fault data from the building systems 142. Based on the fault data (or the absence of fault data), the building health manager 128 can generate building health scores for the building 146. The fault data can include high air pressure faults, high water pressure faults, high temperature faults, coil freezing faults, high voltage faults, overload faults, short circuit faults, earth faults, high harmonic faults, etc.

[0135] Referring now to FIG. 2, the building health manager 128 is shown in greater detail, according to an exemplary embodiment. The building health manager 128 is shown to receive building data from systems 224-242 via the edge platform 106 and via an integration interface 202. The systems 224-242 can be systems of the building systems 142. In some embodiments, the integration interface 202 is an Application Programming Interface (API) that interfaces systems 234-242 with the building health manager 128. The building management system (BMS) 224 which can include systems for heating the building 146, cooling the building 146, controlling air quality within the building 146, etc. The lighting systems 226 can include lights and/or light control systems configured to control lighting parameters in various zones of the building 146, e.g., turn lights on or off, control the level of light, control the hue of light, etc.

[0136] The water quality systems **228** can be configured to measure water quality of water for the building **146**, e.g., water used in the building **146** or used by particular systems of the building **146**. The shade control system **230** can be configured to control the shades (e.g., control shade position) of various windows of the building **146**. The cafeteria systems **232** can be configured to manage food ordering and/or food delivery within the building **146**. The indoor positioning systems **234** can be configured to identify occupants and/or track the location of occupants within the building **146**, e.g., through Wi-Fi triangulation or trilateration, Bluetooth beacons, 5G tracking, GPS, etc.

[0137] The sound systems **236** can be control sound played by speakers throughout various zones of the building **146**. The sound systems **236** can control announcements, music, white noise, etc. The email systems **240** can manage email servers for sending and/or receiving emails. The email systems **240** can manage email accounts for various employees, tenants, and/or users of the building **146**. The social media platforms **242** can be a social media platform that facilitates message post feeds, group conversations, messaging, etc. The social media platforms **242** can include social media accounts for the building **146** or entity, e.g., a company, a tenant of the building **146**, an employee of the building **146**, etc.

[0138] The seating systems **238** can be systems that perform desk scheduling, e.g., hot desking. Furthermore, the seating systems **238** can track the number and locations of desks, seats, tables, chairs, couches, etc. throughout the building. For example, the seating systems **238** can provide the building health manager **128** with data pertaining to seating, seating scheduling, and/or what types of seats occupants are using.

[0139] The building health manager **128** includes various components for managing or operating the systems **224-242**. The building health manager **128** includes a command manager **204**, a dashboard manager **206**, an accessibility manager **208**, a request manager **210**, a suggestion manager **212**, a control manager **214**, a feedback manager **216**, a notification manager **218**, an ordering manager **220**, and a booking manager **222**.

[0140] The command manager **204** can be configured to control systems **224-242**. The command manager **204** can receive commands for controlling characteristics of the building **146** from the user device **148** and operate the systems **224-242** based on the commands. The command manager **204** can control zone temperature, control HVAC equipment on or off status, control optimum equipment start, control humidity, control indoor air quality (IAQ), control static pressure, operate an air/night purge mode, control air velocity in the building **146**, control particulate matters in the building **146**, activate filters, control organic gasses in the building **146**, control inorganic gasses in the building **146**, control radon levels in the building **146**, control water quality in the building **146**, control water temperature, turn lights on or off, control light intensity, control sunshades, control noise levels of the building **146**, control music played in the building **146**, personalize comfort, turn desk lights on or off, control desk light intensity, control desk light color, control music played in a gym, etc.

[0141] The dashboard manager **206** can generate dashboards for display via the user device **148**. The user device **148** can provide input via the dashboards. The dashboard can display, and/or provide control over, zone temperature,

static pressure, air velocity, particulate matters, gasses, water quality, light status, sunshade status, sanitization status, gym occupancy status, etc.

[0142] The feedback manager **216** can aggregate feedback received from the user device **148**. The feedback manager **216** can generate feedback reports based on the feedback collected. The feedback reports can include complaints and/or feedback over building smell, water quality, noise levels, employee sickness, etc.

[0143] The accessibility manager **208** can facilitate navigation or directions for the user device **148**. The accessibility manager **208** can receive navigation requests via the user device **148** and generate navigation directions for display to the user via the user device **148**. The navigation directions can aid users in finding or viewing information pertaining to water refilling stations, eating areas, contract tracing, gardens, other employees, rooms, etc. In some embodiments, the accessibility manager **208** receives data from elevator systems and/or escalator systems.

[0144] The notification manager **218** can be configured to generate alerts pushed and/or communicated to the user device **148**. The alerts can be a dehydration alert, a sunshade alert, a sanitization completed alert, duress alarms, a food order ready alert, a fruit basket arrived alert, a lunch break alert, a coffee break alert, an eye relaxation alert, a social distancing alert, a health data alert, a fitness program alert, a pest control status, a fitness awareness alert, a no movement alert, a gym occupancy alert, a hand washing alert, a sanitization alert, a medical emergency alert, an indoor air quality alert, a bush fire alert, a mental health program alert, a nearby social event alert, etc.

[0145] The request manager **210** can receive requests from the user device **148** and make control updates and/or notify technicians to improve systems of the building **146** based on the requests. The requests may be requests to improve smell, improve air replacement, add more water refilling stations, request a desk or room booking, request sanitization for an area or desk, order food, pest control, playing music in a gym, facilitate air replacement, book a bicycle or vehicle, etc.

[0146] The ordering manager **220** can be configured to order food and/or drinks for users. A user can place an order to the cafeteria systems **232** via the user device **148**. In some embodiments, the order can include a delivery request with delivery location (e.g., employee desk).

[0147] The suggestion manager **212** can be configured to generate suggestions for improving employee mental and/or physical health. The suggestion manager **212** can send the suggestions to the user device **148**. The suggestions may be nourishment education, physical activity suggestions, hand washing suggestions, mental health suggestions, suicide prevention help, etc. The booking manager **222** can be configured to facilitate room or desk booking. For example, the booking manager **222** can book conference rooms, meeting rooms, make gym appointment bookings, etc. Furthermore, the booking manager **222** can facilitate desk booking, e.g., hot-desking.

[0148] Referring now to FIG. 3, a Venn diagram **300** of planet health parameters **302**, space health parameters **304**, and people health parameters **306** contributing to an overall building health score **308** is shown, according to an exemplary embodiment. The planet health parameters **302**, the space health parameters **304**, and the people health parameters **306** can individually describe the health of different

aspects of the building 146, e.g., the planet, spaces of the building 146, and people of the building 146. Together, the planet health parameters 302, the space health parameters 304, and the people health parameters 306 can contribute to an overall building health score 308. In some embodiments, the people health parameters 306 do not include any medical records of individuals. In this regard, the building health manager 128 can determine the influence of building system operation on the mental and/or physical health of occupants without requiring private medical records.

[0149] The planet health parameters 302 can be scores that describe the effect of operating the building 146 on the planet. For example, the planet health parameters 302 can indicate how much energy is consumed by the building 146, how much pollution is generated by the building 146, how much air is filtered by the building 146, etc.

[0150] The people health parameters 306 can be scores that describe the effect of operation of the building 146 and/or services offered by the building 146 on people, occupants of the building 146. The people health parameters 306 can indicate mental and/or physical health of occupants of the building 146. For example, temperature and/or humidity settings can be rated according to occupant comfort. Light levels, light color, and/or light hue can be rated according to the mental affect that the light has on the occupants. Similarly, services such as having a gym, personal trainer, healthy food options, etc. offered by the building 146 can indicate whether the scores describing whether the occupant health is high or low.

[0151] The space health parameters 304 can indicate the health levels of spaces of the building 146. For example, the presence of faults in building environmental control systems can indicate whether the building environmental control systems are operating well. Furthermore, emergencies such as flooding, fire, cyber security attacks, etc. can all indicate the health of space of the building 146.

[0152] Referring now to FIG. 4, a diagram 400 of process health parameters 410, resource health and sustainability parameters 402, occupancy health and wellness parameters 404, safety and security health parameters 406, and system health parameters 408 is shown, according to an exemplary embodiment. The diagram 400 illustrates the planet health parameters 302, the people health parameters 306, and the space health parameters 304.

[0153] Furthermore, the relationships between the process health parameters 410, the resource health and sustainability parameters 402, the occupancy health and wellness parameters 404, the safety and security health parameters 406, and the system health parameters 408 and the planet health parameters 302, the people health parameters 306, and the space health parameters 304. As shown by the diagram 400, the process health parameters 410, the system health parameters 40, and the safety and security health parameters 406 are all parameters of the space health parameters 304. The resource health and sustainability parameters 402 are parameters of the planet health parameters 302. Furthermore, the occupant health and wellness parameters 404 are parameters of the people health parameters 306.

[0154] The process health parameters 410 can represent the health of processes of the building 146. The process health parameters 410 are shown and described in greater detail with respect to FIG. 9. The process health parameters 410 can be parameters that describe that presence and/or performance of processes such as regulatory compliance and

audit, standard operating procedures, proactive maintenance and service, and/or quality of response. The process health parameters 410 can indicate the health of various services offered in the building 146, e.g., whether maintenance workflows are efficient, whether work order creation is automated, the presence of safety recommendations, the presence of informed capital planning services, whether cleaning services are efficient, etc.

[0155] The system health parameters 408 can be parameters that describe system health of systems of the building 146. The system health parameters 408 are shown and described in greater detail with respect to FIG. 8. The system health can be the health of a building automation system (BAS), fire systems, security systems, lighting systems, indoor positioning system data, electrical system data, etc. The system health can be reliability of control systems, the presence of autonomous control, the number of alarms, faults, manual override, etc. The system health parameters 408 can be based on air and water quality, sanitization of spaces, proactive asset maintenance, space utilization, whether spaces are smoke free, noise levels, space furnishing and usefulness, etc. The system health parameters 408 can include the software version of equipment of the building 146 and/or whether the equipment software versions are up to date.

[0156] The resource health and sustainability parameters 402 can indicate the effect of resource usage by the building system of the building 146 on the planet. The resource health and sustainability parameters 402 are shown and described in greater detail FIG. 10. The resource health and sustainability parameters 402 indicate the success of sustainability goals and/or net zero energy usage goals. The resource health and sustainability parameters 402 include the success of carbon footprint reduction. The resource health and sustainability parameters 402 indicate efficiency of HVAC operation, lighting operation, and/or utility usage. The resource health and sustainability parameters 402 indicate active utilization of spaces and assets. Furthermore, the resource health and sustainability parameters 402 indicate the presence and/or performance of central plant optimization and/or performance.

[0157] The resource health and sustainability parameters 402 further indicate energy health, e.g., whether electricity and/or water (e.g., hot water, cold water, etc.) is being used efficiently, whether HVAC systems and/or lighting control systems are operating autonomously to reduce energy usage, whether peak demand systems are operating properly, etc.

[0158] The occupant health and wellness parameters 404 indicate the mental, emotional, and/or physical health of occupants of the building 146. The occupant health and wellness parameters 404 are shown and described in greater detail with reference to FIG. 6. The occupant health and wellness parameters 404 indicate indoor air quality, the level of comfort for spaces of the building 146, whether a work environment is productive, the presence of frictionless experiences, the presence of social distancing, contact tracing, and engagement in the building 146, nourishment services, fitness services, stress, hand washing, etc.

[0159] The safety and security health parameters 406 can indicate health levels of security systems of the building 146. The safety and security health parameters 406 are shown and described in greater detail with reference to FIG. 7. The safety and security health parameters 406 indicate emergency responsiveness of security systems, the presence

or absences of physical and/or cyber security threats, safety incidents that have occurred, alarm information, and/or whether safety and/or security needs of occupants of the building 146 are met. The safety and security health parameters 406 can indicate cyber security health levels, e.g., security levels of networks, Wi-Fi coverage in buildings, bandwidth availability of networks, antivirus presence and performance, firewall presence and performance, the presence of network security at particular ports, etc.

[0160] Referring now to FIG. 5A, the building 146 with the health parameters 402-410 of FIG. 4 is shown, according to an exemplary embodiment. The building 146 includes various pieces of equipment and a building space 502. However, any number and type of HVAC, security, fire response, or any other building subsystem can be included within the building 146 in addition to a variety of different spaces.

[0161] The building 146 includes an air handling unit 504 connected to a building management system 514 (e.g., one or more controllers). The building 146 further includes a British Thermal Unit (BTU) meter 534 and an electrical meter 531. The meters 534 and 531 can track the operation of the air handling unit 504, i.e., electricity used by the air handling unit 504 and/or thermal energy generated by the air handling unit 504. Furthermore, the meters 534 and 531 can measure electrical energy consumption of various pieces of equipment of the building 146 and/or energy generated by the pieces of equipment to heat or cool the building 146. The building 146 may further include water meters to track the water consumption and usage by equipment of the building 146. The building 146 can include electrical metering, gas metering, water metering, etc. and/or any other meter to track resource consumption of equipment of the building 146. The building 146 can include power generation, fuel management systems, and/or any other system.

[0162] The air handling unit 504 draws outside air through an outside air damper 506 and provides heated or cooled air to the building space 502. An exhaust fan 512 can exhaust air of the building space 502 out of the building 146 through the exhaust air damper 510.

[0163] The meters 534 and 531 can track energy usage of the building 146 and the efficiency of equipment of the building 146 to determine the effect of operation on the building 146 on the planet, e.g., the environment outside the building 146. The building health manager 128 can track the resource usage of the building 146 via the meters 534 and 531 and determine the resource health and sustainability parameters 402 to track an efficiency, sustainability, and/or energy usage of the building 146. For example, the building health manager 128 can determine whether an excessive amount of kWh is being consumed by the air handling unit 504.

[0164] Furthermore, occupant health and wellness parameters 404 can be determined for occupants of the building 146, e.g., the occupant 532, by the building health manager 128. The building health manager 128 can track what services are offered to the occupant 532, e.g., exercise programs, the availability of a gym, comfort levels of the building space 502, etc. The building health manager 128 can generate occupant health and wellness parameters 404 to track how well the building space 502 supports occupant mental and physical health.

[0165] The building 146 can determine safety and security health parameters 406. Security and fire systems 536 of the

building can track events occurring in the building 146, e.g., the presence of fires, glass breaks, door forced open events, etc. Based on the presence or absence of fire or security threat events, the building health manager 128 can determine safety and security health parameters 406.

[0166] The building space 502 includes a carbon dioxide sensor 520. The carbon dioxide sensor 520 can cause an alarm 522 to be generated responsive to carbon dioxide readings going above a particular level. Responsive to the alarm 522 being generated, a maintenance system 524 can generate a work order 526. The work order 526 can identify the alarm 522, the carbon dioxide sensor 520, the building space 502, and/or any other system associate with the building space 502. The work order 526 can be provided to a user device 530 of a technician 528 who can work on the carbon dioxide sensor 520 or another system of the building 146 to resolve the alarm 522. Responsive to resolving the alarm 522, the technician 528 can provide a notice to the maintenance system 524.

[0167] The process health parameters 410 can be based on alarms, work orders, and technician actions such as the alarm 522 and the work order 526. The building health manager 128 can determine process health parameters 410 based on the performance of processes of the building 146. For example, an average response time indicating an average length of time for a technician to resolve a fault can be one of the process health parameters 410. Furthermore, the frequency of maintenance performed on building equipment of the building 146 can be another one of the process health parameters 410. Furthermore, the building health manager 128 can determine whether faults are present and in what number for building systems of the building 146, e.g., whether a fan is in a fault mode, whether a filter is clean, etc. The presence and number of the faults can be parameters of the process health parameters 410.

[0168] Referring now to FIGS. 5B-5D, schematic drawings of the building of FIG. 5A in the building of FIG. 5A where an artificial intelligence performs a mode selection for balancing the health parameters is shown, according to an exemplary embodiment. FIGS. 5B-5D illustrate balancing a fresh air intake per person parameter for the building space 502 by an artificial intelligence is shown. The artificial intelligence can be implemented and trained by the building health manager 128 and can be any type of artificial intelligence, e.g., a neural network, a linear programming component, a Gaussian model, a support vector machine, a Bayesian network, a decision tree, etc.

[0169] The building health manager 128 can implement an artificial intelligence that optimizes operation parameters of the building space 502. The artificial intelligence can determine what setting values result in optimal score(s) based on the people health parameters 306, the space health parameters 304, and the planet health parameters 302. The people health parameters 306 relate to occupant wellness, safety, satisfaction, and productivity of the building space 502. The people health parameters 306 can be parameters based on occupant health, e.g., whether air of the building space 502 is clean, whether ergonomics of the building space 502 are good, whether security of the building space 502 is present and operational, occupant wellness, and/or cleanliness and infection risk for occupants of the building space 502.

[0170] In some embodiments, adjusting environmental control parameters of the building management system 514 in the building space 502 to reduce the chance of air-borne

infections between occupants can consume more energy and could make the building space 502 uncomfortable. Therefore, the artificial intelligence can solve and optimize for the people health parameters 306, the space health parameters 304, and the planet health parameters 302 to help a building achieve more of your objectives without sacrificing others, or at the very least inform a user of decisions for a building and provide operating recommendations to the users. In some embodiments, the element 550 is a user interface element that illustrates the operation of the artificial intelligence or an adjustable element for allowing a user to input control into a system. For example, when an infectious disease control mode of the element 550 is selected, as shown in FIG. 5C, the air flow increases, and the impact of this change can affect several other outcomes of the parameters 302-306. When the energy efficient mode of the element 550 is selected, as shown in FIG. 5D, the air flow decreases, and the impact of this change can affect the parameters 302-306. By understanding, calculating, monitoring, and reporting these impacts, the building health manager 128 can make it easier for a user to operate a buildings and meet more objectives for the building.

[0171] As shown in FIGS. 5B-5D, it can be seen that increasing the fresh air intake for the building space 502 will have an impact on multiple other aspects of building health as represented by the dials for the parameters 302-306. For example, by increasing the fresh air intake can require one or more fans to operate which can increase occupant health (the primary objective) but will also increase operation cost, lower asset life, increase risk for equipment downtime, increase energy consumption, etc. The element 550 can provide multi-factor decisions making for a building and putting owners/operators in control by informing their decisions and ultimately optimizing their objectives.

[0172] The planet health parameters 302 can include parameters that relate to resource sustainability and quality of life for local communities. The planet health parameters 302 can include energy consumption, certifications and compliance with energy standards, and whether or not the building space 502 achieves net zero emissions. The planet health parameters 302 include how much renewable energy is used for the building space 502, a carbon footprint of the building space 502, resource conservation for the building space 502, whether the building space 502 has reduced emissions, sustainability, etc.

[0173] The space health parameters 304 can include parameters that relate to building system resiliency factors, process and operations health that focuses on service effectiveness for asset and space maintenance and important tasks, and life safety and security health that focuses on physical and cyber security health as well as building emergencies and alarms. The space health parameters 304 can include operation cost of the building space 502, asset lift of assets of the building space 502, equipment downtime of equipment that operates the building space 502, and return on investment for the building space 502.

[0174] The space health parameters 304 can relate too life safety and security health, e.g., whether life safety systems are present for the building space 502, whether security and access control systems are present for the building space 502, cyber security status for equipment of the building space 502, emergency response systems presence and/or status for the building space 502, alarm management presence and/or status for the building space 502, etc.

[0175] The space health parameters 304 include process and operation health parameters, e.g., workflows, audits, permits, scheduled tasks, etc. The space health parameters 304 can further indicate system health of systems of the building space 502, e.g., health of automation systems, networks, electrical systems, metering systems of the building space 502.

[0176] The building health manager 128 can continuously measure criteria or factors that can impact the health of the building space 502, e.g., collect data for the people health parameters 306, space health parameters 304, and the planet health parameters 302. By measuring and calculating scores for these criteria, the building health manager 128 can systematically and repeatedly monitor and report on the people health parameters 306, the space health parameters 304, and the planet health parameters 302 for the building space 502. Furthermore, the building health manager 128 can track negative impacts to the scores, and offer reactive and predictive recommendations that would produce positive changes to the scores. The scoring implemented by the building health manager 128 provides a consistent, normalized view of a building space 502 health and removes the technical lens which makes the information faster and easier to consume.

[0177] The building health manager 128 can generate overall scores for the building space 502 and/or the people health parameters 306, the space health parameters 304, and the planet health parameters 302. The scores can be determined for a group of buildings, a building, or a particular space within a building. The scores can provide a baseline for health and performance on a consistent scale so a system or user can understand how well or poorly a building is performing. The scores can be generated in real-time for the building health manager 128 to provide real-time improvements and trended improvements over time. The scores can be generated by the building health manager 128 on a space and building level to help users or systems to identify the best and worst performing buildings of a group of buildings, floors of a building, spaces of a floor of a building, etc. Furthermore, the scores for multiple buildings determined by the building health manager 128 can be used to compare one building against peer buildings to understand how the one building is operating. Furthermore, the scores can be used to make informed capital planning and investment decisions.

[0178] Referring now to FIG. 6, a schematic drawing 600 of occupant health and wellness parameters 404 is shown, according to an exemplary embodiment. The occupant health and wellness parameters can be values, information, and/or scores describing various aspects of occupant health and wellness. The occupant health and wellness parameters 404 can be based on building data received by the building health manager 128 received from the building systems 142 and the external systems 144. The building data can indicate the presence and/or performance of the building systems 142 and/or systems or services offered by the building 146.

[0179] The occupant health and wellness parameters 404 include an air parameter 602, e.g., air parameter 612 which indicates whether air levels are healthy for an occupant. For example, the air parameter 612 can indicate whether there is enough airflow within the building 146 or what the levels of carbon dioxide (CO₂), volatile organic compound (VOC), pollen, pollution, etc. are for the building 146. The air

parameter 612 can indicate whether the levels of gasses within the building 146 are healthy for a user.

[0180] The occupant health and wellness parameters 404 include ergonomics parameters 604 such as a light parameter 614, a sound parameter 618, a social parameter 624, a thermal comfort parameter 616, a seat parameter 620, and a mind parameter 622. The ergonomics parameters 604 indicate efficiency of occupants working in the building 146. The light parameter 614 indicates whether the light levels are ideal for a working environment. For example, if light levels are too low, occupants may not work efficiently since low light levels may make the occupants tired. However, if the light levels are too high, occupants may have trouble focusing.

[0181] The thermal comfort parameter 616 can indicate whether temperature and/or humidity levels of the building 146 are at comfortable levels for an occupant. The building health manager 128 can store a chart or table indicating temperature and humidity level ranges that are appropriate for various outdoor air temperatures. The building health manager 128 can compare current temperature and/or humidity levels to the chart or table to determine whether current temperature and humidity is comfortable or uncomfortable. The building health manager 128 can generate recommendations to improve the temperature and/or humidity by suggesting temperature levels and/or humidity levels that are comfortable for occupants at particular outdoor air temperature levels.

[0182] The seat parameters 620 can indicate whether occupants have comfortable and sufficient seating in the building 146. The seating can indicate chairs, tables, desks, couches, cafeteria tables and seating, etc. The building health manager 128 can receive information about the seating available in the building 146 and/or within spaces of the building 146. For example, the building health manager 128 can determine the seat parameters 620 by determining whether there are sufficient numbers of seats for a number of occupants, whether the seats are comfortable for occupants, etc.

[0183] The sound parameter 618 can indicate sound levels of the building 146 and/or building space and whether the sound levels are ideal for working conditions of a building. For example, the building health manager 128 can determine whether sound levels are too noisy for working environments, whether music is played within the building 146 and/or is of a genre ideal for working environments, whether noise cancellation is activated for the building 146 or a building space, etc.

[0184] The mind parameter 622 indicates whether services offered by the building help occupants mental health. For example, counseling services offered by the building 146, human resources services offered by the building 146, vacation time offered to employees, work load of employees, reported occupant stress levels, etc. The building health manager 128 can generate the mind parameters 622 from building data.

[0185] The social parameter 624 can indicate social offerings of the building 146. For example, the social parameter 624 can indicate the presence, frequency, and/or availability of social gatherings. For example, the social parameter 624 can be based on scheduling data received by the building health manager 128. Furthermore, the social parameter 624 can indicate whether the location of occupants of the building 146 is near other occupants to verify that occupants are

not isolated. For example, the building health manager 128 can determine occupant desk locations and whether occupants desk locations are in proper proximity with other occupants for social purposes.

[0186] The occupant health and wellness parameters 404 include security parameters 606. The security parameters 606 can indicate whether occupants are secure within the building 146. The security parameter 606 include an occupancy parameter 626 which indicates occupant levels of the building 146, e.g., how many occupants are within the building 146. If too many occupants are within the building 146, the probability of danger may increase, the probability of the spread of disease may increase, etc. The building health manager 128 can determine occupant levels of the building 146 based on building data received from the building systems 142.

[0187] The security parameters 606 include an emergency parameter 628. The emergency parameter 628 can indicate emergency response readiness for the building 146. For example, the emergency parameter 628 can indicate whether emergency alert stations are within the building 146, whether security of the building 146 is properly staffed, whether building occupants are properly trained for emergency evacuation, etc. The security parameter 606 can include an accessibility parameter 630. The accessibility parameter 630 can indicate navigation abilities of the building 146, e.g., whether the building 146 has a system for navigating through spaces of the building 146.

[0188] The occupant health and wellness parameters 404 include wellness parameters 608. The wellness parameters 608 can track activities of a user, e.g., how much water, food, or exercise a user gets in a day, week, month, etc. The wellness parameters 608 include a water parameter 632 indicating how much water a user has drank. A user may record, via a user device, how much water the user drinks during a day. Similarly, the wellness parameters 608 includes a food parameter 634 indicating what food an occupant eats. A user may record what food the user consumes throughout the day and whether the food that the user has eaten is healthy. In some embodiments, the food parameter 634 indicates whether food services within the building 146, e.g., a cafeteria, offer healthy food, offers unhealthy food, offers nutrition advice services, etc.

[0189] The fitness parameters 636 indicate whether occupants of the building exercise and/or have access to exercise equipment, classes, gyms, etc. For example, whether occupants attend exercising classes, go to the gym, attend personal training sessions, etc. can be indicated by the fitness parameter 636. The fitness parameter 636 can indicate whether the building 146 has a gym, offers fitness classes, offers personal training, etc.

[0190] The cleanliness and anti-infection parameter 610 indicates whether the building 146 and/or occupants of the building 146 are clean. The cleanliness and anti-infection parameter 610 includes a handwashing parameter 638, a pest control parameter 640, and a sanitization parameter 642. For example, the handwashing parameter 638 indicates whether handwashing is available in the building 146 and/or whether sinks, air driers, soap dispensers, etc. are functioning properly. The sanitization parameter 642 indicates whether hand sanitizer dispensers are located at entrances of the building 146, at doorways, dispersed through the building 146, etc.

[0191] Referring now to FIG. 7, a schematic drawing of safety and security health parameters 406 are shown, accord-

ing to an exemplary embodiment. The safety and security health parameters 406 include a life safety systems parameter 702, a security and access control parameter 704, a cyber-security parameter 706, an emergency response parameter 708, and alarm reduction parameter 710. The safety and security health parameters 406 can be based on building data received by the building health manager 128 received from the building systems 142 and the external systems 144. The building data can indicate the presence and/or performance of the building systems 142 and/or systems or services offered by the building 146.

[0192] The life safety systems parameter 702 include a fire alarm parameter 712 indicating whether a fire alarm system is present in the building 146 and/or whether the fire alarm system has detected fires and/or smoke within the building 146. The life safety systems parameters 702 include a water leak detection parameter 714. The water leak detection parameter 714 includes the presence of a water detection system and/or whether the water detection system has detected water leaks in the building 146. The life safety systems 702 include fire suppression parameter 728. The fire suppression parameter 728 indicates the presence and/or health of fire safety systems of the building 146. For example, the fire suppression parameter 728 can indicate whether placement of fire extinguishers in a building are appropriate, whether fire sprinkler systems are functioning properly, audit test results of fire suppression systems of the building 146, etc.

[0193] The public addressing system parameters 730 indicate whether a building addressing system is present in the building 146 and/or whether the public addressing system is operating correctly. For example, technicians can perform a test to verify that a public addressing system can broadcast messages properly and/or to all locations within a building. The result of the test can be one parameter of the public addressing system parameters 730.

[0194] The security and access control parameters 704 include parameters that indicate the presence and/or performance of security and access control systems of the building. For example, the building health manager 128 can be configured to receive alarm and/or fault data, maintenance reports, etc. of security and access control systems of the building 146 and determine the security and access control parameters 704 based on the data. The security and access control parameters 704 can include an access control system parameter 716 for an access control system, a surveillance system parameter 718 for a surveillance system, a facial recognition parameter 732 for a facial recognition system, and/or a number plate recognition parameter 734 for a number plate recognition system.

[0195] The cyber security parameter 706 indicates cyber security of the building 146. The cyber security parameter 706 indicates a network security parameter 720 indicating network security of the building 146, e.g., the number and type of current network cybersecurity threats (e.g., hacking threats, malware threats, etc.). Furthermore, the cyber security parameter 706 includes a data security parameter 736 indicating whether data storage of building systems of the building 146 are secure, e.g., whether they use the proper encryption, proper firewalls, etc.

[0196] The emergency response parameters 708 include parameters such as emergency notification system parameters 722, incident management parameters 724, risk analysis parameters 738, and/or digital standard operating procedure parameters 740.

The emergency response parameters 708 can indicate the presence and/or performance of various systems of the building 146. The emergency response parameters 708 can indicate the presence and/or performance of emergency response systems in the building 146.

[0197] The emergency notification system parameter 722 can indicate the presence and/or performance of an emergency notification system, e.g., a siren system, a light flashing system, an exit system, an evacuation system, etc. The emergency response parameter 708 includes a risk analysis parameter 738. The risk analysis parameter 738 indicates the presence and/or performance of a risk analysis system that analyzes risk for a building. The risk analysis system may be the risk analysis system described with reference to U.S. patent application Ser. No. 16/783,936 filed Feb. 6, 2020, the entirety of which is incorporated by reference herein. Furthermore, the emergency response parameters 708 include an incident management parameter 724 indicating the presence and/or performance of an incident management system of the building 146. Furthermore, the emergency response parameter 708 includes a digital standard operating procedure parameter 740 indicating the presence and/or performance of a digital standard operating procedure system within a building 146. The digital standard operating procedure system may be the same and/or similar to the standard operating procedure system described in U.S. application Ser. No. 16/559,318 filed Sep. 3, 2019 and U.S. patent application Ser. No. 17/062,003 filed Oct. 2, 2020, the entirety of both of which are incorporated by reference herein.

[0198] Furthermore, alarm reduction parameters 710 include false alarm reduction system parameters 726 and/or data standardization parameter 742. The false alarm reduction system parameter 726 can indicate the presence and/or performance of a false alarm reduction system of the building 146. For example, the false alarm reduction system can be a system that receives false alarms in the building 146. The false alarm reduction system parameters 726 can indicate the success in reducing false alarms in the building 146. The false alarm reduction system can be the false alarm reduction system described in U.S. patent application Ser. No. 15/947,725 filed April 6, 2018, the entirety of which is incorporated by reference herein.

[0199] Referring now to FIG. 8, a schematic drawing 800 of system health parameters 408 is shown, according to an exemplary embodiment. The system health parameters 408 include automation system parameters 802, networks parameters 804, electrical systems parameters 806, and metering systems parameters 808. The safety and security health parameters 406 can be based on building data received by the building health manager 128 received from the building systems 142 and the external systems 144. The building data can indicate the presence and/or performance of the building systems 142 and/or systems or services offered by the building 146.

[0200] The automation system parameters 802 indicate the presence and/or performance of automation systems of the building. For example, the building health manager 128 can determine whether automation systems are present within the building and/or operation correctly, e.g., whether faults are present and/or test results indicate that the automation systems are operating properly. The automation system parameters 802 include BAS system parameters 810 for a BAS system, lighting management system parameters 812

for a lighting management system, parking management system parameters **814** for a parking management system, and indoor positioning system parameters **816** for an indoor positioning system.

[0201] The networks parameters **804** can indicate the performance of networks of the building **146**. For example, the network parameters **804** can be determined by the building health manager **128** based on network data received by the building health manager **128**. The building health manager **128** can indicate performance parameters such as bandwidth, network speed (e.g., upload speed and/or download speed), network coverage within the building **146**, etc. The networks parameters **804** include local area network (LAN) network parameters, Wi-Fi network parameters **820**, Bluetooth network parameters **822**, and/or cellular network parameters **824**.

[0202] The electrical systems parameter **806** indicate the presence and/or performance of electrical systems within the building **146**. For example, the building health manager **128** can be configured to receive data indicating the presence of various electrical systems and/or whether the various electrical systems are operating properly (e.g., whether the systems have faults). The electrical systems parameters **806** include a power generation system parameter **826** for power generation systems, a power quality system parameter **830** for power quality systems, a power distribution system parameter **828** for power distribution systems, and an electrical protection system parameter **832** for electrical protection systems.

[0203] The metering systems parameters **808** indicate the performance of meters of the building **146**. For example, the metering systems parameters **808** indicate whether meters of the building have faults, the accuracy of the meters, the precision of the meters, etc. The building health manager **128** receives meter data and determines the health of the meters. Furthermore, the building health manager **128** can use meter measurements the meter data to determine the health of other system so the building. For example, the building health manager **128** can identify efficiencies or issues of building equipment based on the measurements of the meters. The metering systems parameters **808** include electrical metering parameters **834**, gas metering parameters **836**, water metering parameters **838**, and/or fuel metering parameters **840**.

[0204] Referring now to FIG. 9, a schematic drawing **900** of process health parameters **410** is shown, according to an exemplary embodiment. The process health parameters **410** include workflows parameters **902**, audit parameters **904**, permits parameters **906**, and/or scheduled tasks parameters **908**. The building health manager **128** can be configured to determine the process health parameters **410** based on building data received from the building **146**. For example, the building data can indicate the presence and/or use of various services and systems within the building **146**. Furthermore, the building data can indicate whether the systems are operating properly.

[0205] The workflows parameters **902** include a work order system parameter **910** for a work order system. The work order system can facilitate the automatic generation, or user requested generation, of work orders for technicians to repair systems of the building. The work order system parameters **910** can indicate the presence of a work order system in the building **146**, an average response time for work orders (e.g., how quickly a work order is performed by

a technician), etc. The workflows parameters **902** include requests parameters **912** for a request system of the building **146**. The requests parameters **912** can indicate whether a request system is present in the building **146** and/or the performance of the request system, e.g., whether request are being responded to, the amount of time from when a request is generated to when a request is answered, etc.

[0206] The workflows parameters **902** include a complaints parameter **914** for a complaints system. The complaints system can be a system that allows a building occupant to file a complaint regarding the building **146**. The complaints parameters **914** can indicate whether a complaints system is present in the building and/or the performance of the complaints system, e.g., how widely adopted the complaints system is, how quickly the complaints are addressed, etc. The workflows parameters **902** include a feedbacks parameter **916** for a feedback system. The feedbacks parameter **916** can indicate the presence, adoption, or review time of the feedback system.

[0207] The audit parameters **904** can indicate audit results of fire systems of a building. For example, audit results of emergency exists, fire hydrants and sprinkler systems, fire detection and alarm systems, and/or fire extinguishers. The building health manager **128** can be configured to receive audit data from audit systems for the various fire systems of the building. The audit parameters **904** include an emergency fire exits parameter **918** for emergency fire exits, a fire hydrant and sprinkler system parameter **920**, a fire detection and alarm parameter **922**, and a fire extinguishers parameter **924**.

[0208] The permit parameters **906** indicate parameters for permits given out for various aspects of a building. For example, the permit parameters **906** include a lock-out and tag-out parameter **926**, a confined spaces parameter **930**, a scaffolding parameter **928**, and a chemical and explosive parameter **932**.

[0209] The scheduled tasks parameter **908** include an electrical maintenance parameter **934**, a fire drill parameter **938**, a toilet cleaning parameter **936**, and a mechanical maintenance parameter **940**. The scheduled tasks parameter **908** can indicate the health of task scheduling of various systems of the building **146**. The task scheduling health can indicate that maintenance, drills, cleaning, etc. are scheduled and performed at an appropriate frequently. The scheduled tasks parameters **908** include an electrical maintenance parameter **934**, a toilet cleaning parameter **936**, a fire drill parameter **938**, and a mechanical maintenance parameter **940**.

[0210] Referring now to FIG. 10, a schematic drawing **1000** of resource health and sustainability parameters **402** is shown, according to an exemplary embodiment. The resource health and sustainability parameters **402** include parameters that indicate the effect of building operation of the building **146** on the environment. The building health manager **128** can be configured to receive building data from the building systems **142** and determine the resource and sustainability parameters **402**.

[0211] The resource health and sustainability parameters **402** include renewable energy parameters **1002**. The renewable energy parameters **1002** can indicate whether the building **146** uses renewable energy sources such as solar panels or wind power. The renewable energy parameters **1002** include a solar panels parameter **1012** for the presence of

solar panels in the building **146** and wind power parameters for the presence in wind power systems associated with the building **146**.

[0212] The reduce carbon footprint parameters **1004** can include an electric vehicle (EV) system parameter **1016** indicating whether an electric vehicle charging system is available in the building **146**. The reduce waste parameter **1018** can track waste of the building **146** and indicate whether waste is increasing, decreasing, greater than a particular amount, less than a particular amount, etc. The reduce carbon footprint parameters **1004** include an asset efficiency parameter **1020** indicating whether equipment of the building **146** is operating efficiently or inefficiently. Furthermore, the reduce carbon footprint parameter **1004** include space utilization parameter **1022** which indicates whether spaces of the building are at the proper occupancy levels, e.g., whether spaces have too many occupants or not enough occupants.

[0213] The resource health and sustainability parameters **402** include an HVAC performance optimization parameter **1024** indicating if HVAC equipment of the building is optimized to utilize less energy. The resource conservation parameter **1006** indicates a better systems control **1026** indicating whether the building **146** includes system control that minimizes energy usage. Furthermore, the resource conservation parameter **1006** includes a water conservation parameter **1030** indicating water usage by the building **146**. Furthermore, the resource conservation parameter **1006** includes a resource usage conscientiousness parameter **1028** indicating the presence of systems at the building **146** for users to log complaints indicating poor resource usage in the building **146**.

[0214] The reduced emission parameters **1008** include parameters relating to emissions of the building **146**. The building health manager **128** can be configured to receive building data from the building systems **142** and determine the reduced emission parameters **1008** based on the building data. For example, the net zero energy parameter **1032** can indicate whether the building **146** is at net zero energy, i.e., whether all energy consumed by the building **146** is created by the building **146**, e.g., via wind power, solar power, etc. In some embodiments, the net zero energy parameter **1032** indicates how close to net zero energy production the building is at, e.g., a percentage or score. The reduced emission parameter **1008** includes a net carbon emission parameter **1038** indicating how close the building **146** is to net carbon neutrality.

[0215] The reduced emission parameter **1008** include a reduced chemical waste parameter **1034**. The reduced chemical waste parameter **1034** can indicate the levels of chemical waste created by systems of the building **146**, e.g., chemical waste created from disposed light bulbs, oil from oil changes of systems of the building, refrigerant fluid changes, etc. The reduced emission parameters **1008** include a water processing parameter **1036**. The water processing parameter **1036** indicates whether water reuse and processing systems are available at the building **146** that are configured to clean and filter used water and reuse the water in the building **146**. The water processing parameter **1036** can further indicate the percentage of water used at the building **146** is reused water. Furthermore, the reduced emission parameter **1008** indicate carbon emission levels

and/or whether the building **146** is at net zero carbon emission and/or how close the building **146** is to net zero carbon emission.

[0216] The resource health and sustainability parameters **402** include sustainability parameters **1010**. The sustainability parameters **1010** include a clean energy parameter **1040** and a dirty energy parameter **1042**. The clean energy parameter **1040** can indicate what percentage or what amount of electrical energy consumed by the building **146** is clean energy, e.g., originating from clean energy sources such as wind power, solar power, nuclear, etc. The dirty energy parameter **1042** indicates what percentage or what amount of electrical energy consumed by the building **146** is dirty energy, e.g., originating from a coal power plant, gas generator, etc.

[0217] Referring now to FIG. 11, the building health manager **128** is shown generating an overall building score from space health scores, planet health scores, and people health scores, according to an exemplary embodiment. The building health manager **128** can receive building data from building data sources **1102**. For example, the building data sources **1102** can include local subsystems of the building **146** operating at the building, e.g., the building systems **142**. Furthermore, the building data sources **1102** can include the external systems **144**. The building data received by the building health manager **128** can include data such as space temperature, humidity, light levels, equipment fault data, water usage, occupant locations, meeting productivity, food or drink menu nutrition levels, occupant physical activity levels, and/or any other data as described with reference to FIGS. 1-10.

[0218] The building health manager **128** includes a space health scores generator **1104**, a planet health scores generator **1106**, and a people health scores generator **1108**. The space health scores generator **1104** can generate space health scores **1110** for the space health parameters **304**. The planet health scores generator **1106** can generate the planet health scores **1112** for the planet health parameters **302**. The people health scores generator **1108** can generate people health scores **1114** for the people health parameters **306**. In some embodiments, the scores generated by the space health scores generator **1104**, the planet health scores generator **1106**, and the people health scores generator **1108** are scores generated for the parameters described with reference to FIGS. 1-10.

[0219] For example, for the people health scores **1114**, the people health scores generator **1108** can generate scores for parameters that indicate whether a workplace is safe and secure, whether a work environment is comfortable, enhanced productivity of a space, stress of occupants, nutrition and exercise of occupants, frictionless access and services offered by the building **146**, social distancing and contact tracing of the building **146**, and hand washing of the building space.

[0220] For example, the people health scores generator **1108** could generate scores for each parameter. For example, the people health score generator **1108** can generate a score of 9 for the workplace safety and security parameter, a score of 8 for the work environment comfortability parameter, a score of 7 for an enhanced productivity of a space parameter, a score of 7 for a stress of occupants parameter, a score of 8 for a nutrition and exercise of occupants parameter, a score of 10 for a frictionless movement parameter, a score of 6 for a social distancing parameter, a score of 9 for a contact

tracing parameter, and a score of 7 for a hand washing parameter. Based on the scores for the parameters, the people health scores generator **1108** can generate a people health score, e.g., with a score of 8. Similar determinations can be generated for the space health scores **1110** by the space health scores generator **1104** and the planet health scores **1112** by the planet health scores generator **1106**.

[0221] Based on the space health scores **1110**, the planet health score **1112**, and/or the people health scores **1114**, the building health manager **128** can be configured to generate an overall building score with the overall building score generator **1118** of the building health manager **128**. The overall building score generator **1118** can generate an average (e.g., a weighted average) of the space health scores **1110**, the planet health scores **1112**, and/or the people health scores **1114**. The overall building score generator **1118** can be configured to provide the overall building score to a recommendation generator **1116** and/or the user device **148** via a user interface (e.g., the user interfaces shown and described with reference to FIGS. 13-18).

[0222] The recommendation generator **1116** can generate recommendations for improving the overall building score, the space health scores **1110**, the planet health scores **1112**, and/or the people health scores **1114**. The recommendation generator **1116** can generate recommendations to update temperature of spaces, update lighting levels of spaces, offer healthier cafeteria food, offer workout classes, reduce employee workload, improve occupant social distancing, etc.

[0223] In some embodiments, the recommendations can be specific to the space health scores **1110**, the planet health scores **1112**, and/or the people health scores **1114**. For example, the recommendations could be specific to the people health scores **1114**. For example, the recommendation could be to condition meeting rooms prior to a meeting to ensure occupants are comfortable from the start, increase light levels in the building **146** due to lack of natural light, add a wayfinding service to the building **146** to help occupants efficiently navigate the building, remind occupants of proper hand washing techniques, etc.

[0224] The recommendations can be provided to a user via the user device **148** by the recommendation generator **1116**. The user device **148** can approve the recommendations and make updates to the building systems **142**, e.g., the building health manager **128** can provide setting updates to the building systems **142** updating the operation of the building systems **142** in response to receiving user approval. In some embodiments, the building health manager **128** can generate work orders. For example, the work orders may be work orders to install new equipment or services, perform maintenance, etc. Furthermore, in some embodiments, the building health manager **128** can implement the recommendations automatically without requiring user approval.

[0225] Referring now to FIG. 12, a flow diagram of a process **1200** of generating the overall building score from the space health scores **1110**, the planet health scores **1112**, and the people health scores **1114** is shown, according to an exemplary embodiment. The building health manager **128** can be configured to perform the process **1200**. Furthermore, any computing system or device described herein can be configured to perform the process **1200**.

[0226] In step **1202**, the building health manager **128** can receive building data associated with the operation and performance of the building **146** and/or the building systems

142. The building health manager **128** can receive operational data of the building systems **142**, identifying information identifying what subsystems are present in the building **146**, data from the external systems **144**, etc.

[0227] In step **1204**, the building health manager **128** can determine the space health scores **1110** for the space health parameters **304** based on the building data. For example, the building health manager **128** could determine a score for each of the space health parameters **304**. In some embodiments, the building health manager **128** can generate a composite space health score based on the scores for each of the space health parameters **304**.

[0228] In step **1206**, the building health manager **128** can determine the planet health scores **1112** for the planet health parameters **302** based on the building data. For example, the building health manager **128** could determine a score for each of the planet health parameters **302**. In some embodiments, the building health manager **128** can generate a composite planet health score based on the scores for each of the planet health parameters **302**.

[0229] In step **1208**, the building health manager **128** can determine the people health scores **1114** for the people health parameters **306** based on the building data. For example, the building health manager **128** could determine a score for each of the people health parameters **306**. In some embodiments, the building health manager **128** can generate a composite people health score based on the scores for each of the people health parameters **306**.

[0230] In step **1210**, the building health manager **128** can be configured to generate an overall building health score based on a combination of the space health scores **1110**, the planet health scores **1112**, and the people health scores **1114**. For example, the building health manager **128** can generate an average of the space health scores **1110**, the planet health scores **1112**, and the people health scores **1114**. In some embodiments, the average is a weight average. In some embodiments, a user provides weight values for weighting each of the space health scores **1110**, the planet health scores **1112**, and the people health scores **1114**.

[0231] In step **1212**, the building health manager **128** can cause a user interface to display the overall building health score determined in the step **1210**. In some embodiments, the building health manager **128** causes the user interface to include the space health scores **1110**, the planet health scores **1112**, and the people health scores **1114**. The building health manager **128** can cause the user device **148** to display the user interface.

[0232] Referring now to FIG. 13, a building management interface **1300** is shown, according to an exemplary embodiment. The building management interface **1300** displays information indicating actions that should be taken in a building and/or building notifications. The building management interface **1300** can provide a user with a summary of key performance indicators. Furthermore, the building management interface **1300** can provide a user with a menu to navigate to other user interfaces, e.g., the user interfaces described with reference to FIGS. 14-18.

[0233] Referring now to FIG. 14, a building health interface **1400** is shown, according to an exemplary embodiment. The interface **1400** includes an element **1402** indicating scores for a building for a particular day. The element **1402** can include an overall building health score determined by the building health manager **128** from the space health scores **1110**, the planet health scores **1112**, and/or the people

health scores **1114**. Furthermore, the element **1402** includes indications of the space health scores **1110**, the planet health scores **1112**, and the people health scores **1114**. The interface **1400** further includes a score history element **1404**. The element **1404** indicates a history of the overall health score, the space health scores **1110**, the planet health scores **1112**, and/or the people health scores **1114** trended over time.

[0234] The interface **1400** further includes ranked buildings for an entity in element **1406**. The element **1406** indicates multiple different buildings associated with an entity, e.g., shopping locations associated with a retailer, office locations of a company, buildings of a campus, etc. The element **1406** can include an overall building score for each building of the element **1406** ranked in order from lowest score to highest score, in some embodiments.

[0235] Furthermore, the interface **1400** includes a recommendations element **1408** indicating multiple recommendations for improving the building **146**. The recommendations of the recommendation element **1408** could be a recommendation to change the air filter of a device, lower temperature in a particular room, change a water filter in a cafeteria, sanitize particular desks, etc. Furthermore, the interface **1400** includes an alerts element **1410**. The element **1410** indicates alerts for a building, issues that need to be addressed by a technician. For example, the alerts of the element **1410** can include a security alarm of a particular building, a dangerous chemical detected in a particular room, an unscanned entry of a user to a particular location of a building, a building automation system alert level increasing over a particular level, a cellular network outage at the building, etc.

[0236] Referring now to FIG. 15, an occupant health interface **1500** is shown, according to an exemplary embodiment. The occupant health interface **1500** indicates scores for the people health parameters **306**. The occupant health interface **1500** includes an occupant health score element **1502**. The element **1502** indicates a value for the people health scores **1114**. For example, the element **1502** can indicate an overall people health score for the people health parameters **306** for a particular day.

[0237] The interface **1500** includes a wellness element **1504**. The element **1504** can indicate scores and alerts for the water parameter **632**, the fitness parameter **636**, and the food parameter **634**. The interface **1500** further includes a security element **1606** indicating scores and alerts for the occupancy parameter **626**, the emergency parameter **628**, and the accessibility parameter **630**. The interface **1500** includes an air element **1508** indicating a score and associated alerts for the air parameter **612**.

[0238] The interface **1500** includes an ergonomics element **1510** including indications of scores and alerts for the light parameter **614**, the thermal comfort parameter **616**, the seat parameter **620**, the sound parameter **618**, the mind parameter **622**, and the social parameter **624**. Furthermore, the interface **1500** includes a cleanliness and anti-infection element **1512**. The element **1512** indicates scores and alerts for the handwashing parameter **638**, the pest control parameter **640**, and the sanitization parameter **642**.

[0239] The interface **1500** includes a recommendations element **1514**. The recommendations element **1514** further includes an impact value, whether positive or negative, for each recommendation indicating the impact that each recommendation has on the overall occupant health score. The recommendations element **1514** include a recommendation

to change an air filter for a system, lower a temperature in a particular room, change a water filter in a cafeteria, sanitize particular desks, etc. Furthermore, the interface **1500** includes an element **1516** indicating alerts for the building and the impact of each alert on the overall occupant health score. The alerts can indicate a security alarm for a particular building, a chemical detection in a particular room, an unscanned occupant entry event at an entry station, a number of building automation system alerts going over a particular amount, a cellular network outage, etc.

[0240] Referring now to FIG. 16A, a space performance user interface **1600** including infection risk and air quality information is shown, according to an exemplary embodiment. The user interface **1600** includes an element **1602** indicating infectious disease risk for the building **146** and indoor air quality for the building **146**. Furthermore, the space performance user interface **1600** includes an element **1604** indicating a space utilization element **1604**.

[0241] The space performance user interface **1600** includes an infection risk and air quality element **1606**. The element **1606** includes indications of various areas of a building, e.g., floors of the building **146**. The element **1606** further includes infectious disease risk scores, high infection risk alerts, IAQ scores, an IAQ trend, IAQ alerts, and a thirty day energy spend vs. budget score for each of the spaces of the building **146**.

[0242] Referring now to FIG. 16B, another space performance user interface **1650** including infection risk and air quality information is shown, according to an exemplary embodiment. The interface **1650** can be similar to the interface **1600** of FIG. 16A and includes similar elements, e.g., the elements **1602-1606**. Furthermore, the interface **1650** includes an element **1652** that includes an indication of alerts affecting an infectious disease risk score. The interface **1650** includes an element **1654** indicating alerts that affect indoor air quality.

[0243] Referring now to FIG. 16C, a user interface **1660** providing recommendations for a user to select from that effect an infectious disease risk score is shown, according to an exemplary embodiment. The recommendation generator **1116** can generate the user interface **1660** and/or the recommendations included within the user interface **1660**. The user interface **1660** includes an element **1662** indicating a current state of the user interface **1660**. Furthermore, the user interface **1660** includes elements **1664-1668** indicating recommendations.

[0244] The element **1662** provides an indication of a score for infectious disease risk and a current monthly energy cost, e.g., a monthly energy bill. Furthermore, the element **1662** includes an indication of current values for settings such as air flow, comfort, ultraviolet (UV) disinfection, and filtration. Each of the recommendations of the elements **1664-1668** include updates to the values of the current settings. Furthermore, each of the elements **1664-1668** indicate operational adjustments and optional design adjustments.

[0245] Furthermore, each element **1664-1668** indicate predicted updates to the infectious disease risk score and monthly energy cost (e.g., increase or decreases) that will result from the settings of each recommendation. An accept element is included within each of the elements **1664-1668** allowing a user to interact with the interface **1660** and select one of the recommendations. Responsive to selecting one of the recommendations, e.g., the recommendation of element

1664, a user interface displaying operational adjustments **1670**, e.g., the user interface **1680** can be displayed.

[0246] Referring now to FIG. 16D, a user interface **1680** including optional adjustments for one of the recommendations of the interface of FIG. 16C is shown, according to an exemplary embodiment. The user interface **1680** can be displayed responsive to a user interacting with the element **1664**, e.g., “Option 1.” The user interface **1680** includes operational adjustments **1681** and design adjustments **1682** which are optional. The operational adjustments **1681** summarize the changes for the recommendation. A user can navigate to a command and control element for each setting change to implement or review an automatic change made by the system to operating settings for the building systems **142**. The design adjustments **1682** can be optional adjustments which do not affect the predictions of the recommendation but could improve the results of the recommendation. The element **1683** provides a description of the selected recommendation.

[0247] Referring now to FIG. 16E, a user interface **1684** including accepted operational adjustments for the one recommendation of FIG. 16D is shown, according to an exemplary embodiment. The user interface **1684** can be displayed responsive to the settings of the recommendation described in FIG. 16D is accepted by a user. Accepted operational adjustments **1685** and accepted design adjustments **1686** can be displayed in the user interface **1684**.

[0248] Referring now to FIG. 16F, a user interface **1687** including optional adjustments for another one of the recommendations of the interface of FIG. 16C is shown, according to an exemplary embodiment. The user interface **1688** can be displayed responsive to a user interacting with the element **1666**, e.g., “Option 2.” The user interface **1687** includes operational adjustments **1688** and design adjustments **1689** which are optional. The operational adjustments **1688** summarize the setting changes for the recommendation. A user can navigate to a command and control element for each setting change to implement or review an automatic change made by the system to operating settings for the building systems **142**. The design adjustments **1689** can be optional adjustments which do not affect the predictions of the recommendation but could improve the results of the recommendation. The element **1690** provides a description of the selected recommendation.

[0249] Referring now to FIG. 16G, a user interface **1691** including recommendations where a first recommendation needs to be reset before a second recommendation can be accepted is shown, according to an exemplary embodiment. The user interface **1691** can be displayed responsive to a user selecting a recommendation after a first recommendation is selected, e.g., the second recommendation conflicts with the first recommendation. In FIG. 16G, the example is the “Option 2” being selected after the “Option 1” is selected. Element **1692** provides a summary of the “Option 1,” a recommendation selected via element **1664** of FIG. 16C. The element **1693** can provide a summary of the “Option 2,” a recommendation selected via element **1666** of FIG. 16C.

[0250] Referring now to FIGS. 17-18A-B, the space performance user interface **1600** including space utilization information is shown, according to an exemplary embodiment. The space performance user interface **1600** includes a space utilization element **1700**. The element **1700** includes a total utilization **1702** indicating an overall occupancy level

of the building **146**. The element **1700** includes an occupancy profile **1704** indicates occupancy profiles for various days of the week for the building **146**. Furthermore, the element **1706** indicates meeting rooms of various floors of the building **146** and the utilization of each meeting room.

[0251] The space performance user interface **1600** includes a floor utilization element **1708** indicating the floor utilization of a “Floor 1” of the building **146**. The space performance user interface **1600** further includes a most utilized zone element **1710** indicating which zone of the “Floor 1” of the building **146** is the most utilized zone. Furthermore, the space performance user interface **1600** includes a least utilized zone element **1712** indicating the least utilized zone in the building **146**.

[0252] The space performance user interface **1600** includes a yearly utilization element **1714** indicating the yearly space utilization of areas of the building **146**. The space performance user interface **1600** indicates a floor utilization element **1716** indicating floor utilization for a “Floor 2” of the building **146**. The space performance user interface **1600** includes a most utilized zone element **1718** indicating which zone of the “Floor 2” is the most utilized zone. Similarly, the space performance user interface **1600** indicates a least utilized zone element **1720** of the “Floor 2.” The space performance user interface **1600** includes a yearly utilization element **1722** of the “Floor 2” of the building **146**. Furthermore, the space performance user interface **1600** indicates a utilization element **1724** indicating utilization of the building **146** for every thirty minutes of a day. The space performance user interface **1600** further indicates an element **1726** indicating utilization of the building **146** by day for the last thirty days.

[0253] Referring now to FIG. 19, is a table **1900** of air quality parameter scoring is shown, according to an exemplary embodiment. The table **1900** can indicate scoring for the air parameters **602**. The table **1900** indicates sub parameters such as carbon dioxide, duct static pressure, air velocity, air replacement, total volatile organic compound (TVOC), particulate matters, air replacement, etc. The parameters can be parameters measured and/or controlled by the building systems **142** in the building **146**. Furthermore, the table **1900** indicates a criteria for scoring each sub parameter. Each sub parameter includes an allocated score (e.g., the allotted score to the parameter if the criterion is met), a total instances parameter, a deviation instances parameter, and a score calculation (e.g., an equation based on the allocated score parameter, the total instances parameter, and/or the deviation instances parameter).

[0254] Indoor air quality (IAQ) may depend on the presence and abundance of pollutants in the indoor environment that may cause harm. People spend **80-90%** of time in enclosed building, in some cases. During this time, the occupants may inhale indoor air pollutants that could result in short-term or long-term health problems. A ventilation system can be installed in the building **146** to bring required fresh air in from outside and dilute occupant-generated pollutants (e.g., carbon dioxide) and product-generated pollutants (e.g., volatile organic compounds). Poorly ventilated spaces promote symptoms such as headache, fatigue, shortness of breath, sinus congestion, cough, sneezing, eye, nose, throat, and skin irritation, dizziness, and nausea. Furthermore, an airborne disease (e.g., COVID-19) can spread through transmission from one person to another in tiny particles of water and virus called aerosols. Aerosols can

stay floating in the air for hours and can travel long distances. Aerosols can build up if the air inside is not circulated and/or filtered by the building 146 the right way.

[0255] Referring now to FIG. 20, a table 2000 of thermal comfort parameter scoring is shown, according to an exemplary embodiment. The table 2000 can indicate scoring for the air parameters 602. The table 2000 indicates sub parameters such as dry bulb temperature, personalized control optimum start, and/or humidity control, etc. The sub parameters can be parameters measured and/or controlled by the building systems 142 in the building 146. Furthermore the table 2000 indicates a criteria for scoring each sub parameter. Each sub parameter includes an allocated score (e.g., the allotted score to the parameter if the criterion is met), a total instances parameter, a deviation instances parameter, and a score calculation (e.g., an equation based on the allocated score parameter, the total instances parameter, and/or the deviation instances parameter).

[0256] Thermal conditions may be integral to the occupant experience in the building 146. Ventilation, temperature control, and/or humidity are all factors of the building 146 that may contribute significantly to workplace experience and task capabilities. A study on workplace thermal conditions and/or health impacts observed that workers experienced itchy, watery eyes, headaches, and/or throat irritation when thermal factors such as ventilation, humidity, and heat were unfavorable.

[0257] When indoor environments are too warm, there is evidence of increases in sick building syndrome symptoms, negative moods, elevated heart rate, respiratory issues, and feelings of fatigue. Thermal comfort can be more important to office worker performance than job stress or job satisfaction. Thermal comfort may be influenced by objective factors like air temperature, mean radiant temperature, air speed, and humidity, as well as personal factors like metabolic activity level and thermal insulation from clothing.

[0258] Referring now to FIG. 21, a table 2100 of light parameter scoring is shown, according to an exemplary embodiment. The table 2100 can indicate scoring for the light parameters 614. The table 2100 indicates sub parameters such as desk light control, meeting room light control, outdoor conditions, etc. The sub parameters can be parameters indicating the presence or absence of certain systems of the building systems 142 in the building 146. Furthermore the table 2100 indicates a criteria for scoring each sub parameter. Each sub parameter includes an allocated score and a score calculation. The calculation can indicate that the allocated score is attributed to the sub parameter if the system referenced by the sub parameter is present in the building 146.

[0259] The eye can have dual roles. The eye can detect light to allow us to see but also detects light to tell the brain what time of day it is. These visual and non-visual effects of light can have different sensitivities to light intensity, spectrum, timing, pattern, and/or light history and are served by different light detectors (photoreceptors) in the eye. Both roles are important considerations when assessing the quality of a built environment. Light may be the main driver of the visual and circadian systems. Light levels typically experienced indoors (e.g., tens to hundreds of lux) can induce non-visual responses. Therefore the type of lighting occupants are exposed to during the day and night may need to be optimized. Light exposure can impact mood and

reduces symptoms of depression in individuals. Light also has acute effects on our cognitive function and sleep.

[0260] Referring now to FIG. 22, a table 2200 of light sunshade parameter scoring is shown, according to an exemplary embodiment. The table 2200 can indicate scoring for light sunshade parameters. The table 2100 indicates sub parameters for sunshade control. The sub parameters can be parameters indicating the presence and/or operation of sunshade control systems of the building systems 142 in the building 146. Furthermore the table 2200 indicates a criteria for scoring each sub parameter. Some sub parameters includes an allocated score and a score calculation. The calculation can indicate that the allocated score is attributed to the sub parameter if the system referenced by the sub parameter is present in the building 146. For one sunshade control sub parameter, a total number of instances and a total number of deviations are used in a score calculation to determine a score of the sunshade control parameter.

[0261] Many studies on the health impacts of daylight have reported evidence for potential benefits including improvement to vision and sleep quality and reduced symptoms of myopia, eye strain, headache, and depression. Daylight exposure and/or access to windows at work have been linked to improved sleep duration and mood, reduced sleepiness, lower blood pressure and increased physical activity, whereas lack of natural light has been associated with physiological, sleep, and depressive symptoms. Office workers exposed to electric and natural lighting conditions have reported experiencing less glare and less sleepiness earlier in the day under natural lighting compared to when they were under electric lighting. Moreover, not only intensity but also the timing of daytime light exposure has been found to influence body mass index (BMI) in adults, with lower BMI in those who receive most of their bright light exposure earlier rather than later in the day.

[0262] Referring now to FIG. 23, a table 2300 of occupancy parameter scoring is shown, according to an exemplary embodiment. The table 2300 can indicate scoring for light sunshade parameters. The table 2300 indicates sub parameters for occupancy. The sub parameters can be parameters indicating a number of occupants sensed by the building systems 142 in the building 146. Furthermore the table 2300 indicates a criteria for scoring each sub parameter. Some sub parameters include an allocated score, a total instances, a deviation instances, and a score calculation.

[0263] Referring now to FIG. 24, a table 2400 of healthy building parameter scoring is shown, according to an exemplary embodiment. The table 2400 can indicate scoring for the seating parameters 620. The table 2400 indicates sub parameters for seating parameters. The sub parameters can be parameters indicating the presence of hot desking and/or seating systems of the building systems 142 in the building 146. Furthermore, the table 2400 indicates a criteria for scoring each sub parameter. Some sub parameters includes an allocated score and a score calculation. The calculation can indicate that the allocated score is attributed to the sub parameter if the system referenced by the sub parameter is present in the building 146.

[0264] The seating parameters 620 can indicate whether ample active workstations, such as a sit-stand or treadmill desk are available in the building 146. Sedentary behavior has been linked to numerous negative health outcomes, including obesity, type 2 diabetes, cardiovascular and metabolic risks and premature mortality. Sedentary behavior also

poses health risks, despite activity levels, and may even negate the positive health effects associated with physical activity. Active workstations may be effective at decreasing time spent sitting, thereby increasing energy expenditure. Studies do not suggest there is an impact on productivity for sit-stand or treadmill desks with more mixed findings for bicycle desks. Evidence further suggests that offering active workstations along with education, prompts and/or behavior change counseling may support sustained behavior change and further reduce sitting time.

[0265] Referring now to FIG. 25, a table 2500 of sound parameter scoring is shown, according to an exemplary embodiment. The table 2500 can indicate scoring for the sound parameters 618. The table 2500 indicates sub parameters for sound, e.g., noise level, music, etc. The sub parameters can be parameters indicating noise levels sensed by the building systems 142 in the building 146. Furthermore, the sub parameters indicate music playing actions that the building systems 142 can take in the building 146. Furthermore the table 2500 indicates a criteria for scoring each sub parameter. Some sub parameters are associated with an allocated score and a score calculation.

[0266] Noise may be defined as an “unwanted or disturbing sound” that interferes with normal activities such as work, sleeping, and/or conversation. Noise enters building interiors from outside sources such as aircraft, road traffic, trains, lawn mowers, snow blowers, and/or the operation of heavy equipment at construction sites. Indoors, noise can be generated from a mechanical system, HVAC systems, office equipment, vacuum cleaners, industrial machinery, and/or conversations among occupants.

[0267] The presence of background noise can also be disruptive and interfere with an ability of an individual to communicate and clearly perceive speech at a normal speaking volume. Thus, a building occupant may need to raise their voice to compensate. On the contrary, the music involves the use of the whole brain. Music can improve memory, attention, physical coordination and mental development. Classical music can stimulate the regeneration of brain cells. Classical music, played at a moderate volume, can encourage creativity, and/or repair brain damage.

[0268] Referring now to FIG. 26, a table 2600 of sanitization parameter scoring is shown, according to an exemplary embodiment. The table 2600 can indicate scoring for the sanitization parameters 642. The table 2600 indicates sub parameters regarding sanitization in the building 146. The sub parameters can indicate a sanitization schedule of a space, a space sanitization status, and/or sanitization requests for a space. The table 2600 indicates a criteria for scoring each sub parameter. Some sub parameters are associated with an allocated score and a score calculation.

[0269] Referring now to FIG. 27, a table 2700 of food parameter scoring is shown, according to an exemplary embodiment. The table 2700 can indicate scoring for the food parameters 634. The table 2700 indicates sub parameters regarding food ordering, nourishment, fruit basket ordering, food break areas and eating areas, etc. in the building 146. The table 2700 indicates a criteria for scoring each sub parameter. Some sub parameters are associated with an allocated score and a score calculation.

[0270] Healthy diets have the potential to nurture human health and prevent several diet-related diseases, including cardiovascular disease, high blood pressure and diabetes. However, poor nutrition remains a top contributor to disease.

Fruits and vegetables may be a key component of a healthy dietary pattern for the prevention of chronic disease. However, most individuals around the world do not meet the daily recommended five servings. Nutrition education has been shown to be more effective when focused on changing specific behaviors, rather than only increasing knowledge. The scope of nutrition and food education may also be broader than personal nutrition and health. For example, education can cover topics, such as safe food handling practices, gardening and food production techniques, as well as food preparation skills.

[0271] Referring now to FIG. 28, a table 2800 of fitness parameter scoring is shown, according to an exemplary embodiment. The table 2800 can indicate scoring for the fitness parameters 636. The table 2800 indicates sub parameters regarding fitness programs offered in the building 146, fitness awareness, occupant activity levels, gym occupancy status, bicycle stand booking, etc. The table 2800 indicates a criteria for scoring each sub parameter. Some sub parameters are associated with an allocated score and a score calculation.

[0272] Nearly a quarter of the global population do not achieve physical activity guidelines and is considered physically inactive. Key determinants of physical activity behavior include time, convenience, motivation, self-efficacy, weather conditions, travel and family obligations, fear of injury, lack of social support, and/or environmental barriers such as availability of sidewalks, parks and/or bicycle lanes. Physical inactivity has emerged as a primary focus of public health, due to a rise in premature mortality and chronic diseases attributed to inactive lifestyles, including type 2 diabetes, cardiovascular disease, depression, stroke and some forms of cancer. Physical activity can be intimately tied to prevention of these chronic conditions and overall health across the lifespan.

[0273] Referring now to FIG. 29, a table 2900 of handwashing parameter scoring is shown, according to an exemplary embodiment. The table 2900 can indicate scoring for the handwashing parameters 638. The table 2900 indicates sub parameters regarding hand washing, soap dispensers, touchless hand washing, etc. The table 2900 indicates a criteria for scoring each sub parameter. Some sub parameters are associated with an allocated score and a score calculation.

[0274] Handwashing with soap can remove germs from hands. This can help prevent infections because people frequently touch their eyes, nose, and mouth without even realizing it. Germs can get into the body through the eyes, nose and mouth and make people sick. Furthermore, germs from unwashed hands can get into foods and drinks while people prepare or consume them. Germs can multiply in some types of foods or drinks, under certain conditions, and make people sick. Germs from unwashed hands can be transferred to other objects, like handrails, tabletops, or toys, and then transferred to hands of another person. Proper and frequent handwashing can reduce the number of people who get sick with diarrhea by 23-40%, reduce diarrheal illness in people with weakened immune systems by 58%, reduces respiratory illnesses, like colds, in the general population by 16-21%, and/or reduce absenteeism due to gastrointestinal illness in schoolchildren by 29-57%.

[0275] Referring now to FIG. 30, a table 3000 of water quality parameter scoring is shown, according to an exemplary embodiment. The table 3000 can indicate scoring for

water quality parameters **632**. The table **3000** indicates sub parameters for water quality. The sub parameters can be parameters indicating contaminant levels, awareness, hot water quality, water refilling stations, water quality, and/or occupant dehydration alerts. Furthermore the table **3000** indicates a criteria for scoring each sub parameter. Some sub parameters include an allocated score, a total instances, a deviation instances, and a score calculation.

[0276] Water quality can be important because it directly affects the health of the people. When water quality is compromised, its usage puts users at risk of developing health complications. However, many people do not drink enough water, even where safe water is easily accessible. To ensure water quality, it is necessary to test water quality regularly and install water purification system for removal of contaminants, if necessary. Combinations of various building automation system can be used to make drinking water easily accessible and remind occupant if enough water is not consumed during office hours.

[0277] Referring now to FIG. **31**, a table **3100** of pest control parameter scoring is shown, according to an exemplary embodiment. The table **3100** can indicate scoring for pest control parameters **640**. The table **3100** indicates sub parameters for pest control. The sub parameters can be parameters indicating pest control scheduling, pest detections, pest control status, no entry alerts for pest control periods, etc. The table **3100** indicates a criteria for scoring each sub parameter and score calculation for each sub parameter.

[0278] Referring now to FIG. **32**, a table **3200** of emergency parameter scoring is shown, according to an exemplary embodiment. The table **3200** can indicate scoring for emergency parameters **628**. The table **3200** indicates sub parameters for the emergency parameters **628**. The sub parameters can be parameters indicating a SOS button for occupancy emergencies, an alert and location sharing feature, a SOS alert for inorganic gas levels, and/or an SOS alert for occupants in the case of bush fires, etc. The table **3200** indicates a criteria for scoring each sub parameter and score calculation for each sub parameter.

[0279] Referring now to FIG. **33**, a table **3300** of accessibility parameter scoring is shown, according to an exemplary embodiment. The table **3300** can indicate scoring for accessibility parameters **630**. The table **3300** indicates sub parameters for outdoor access, indoor navigation, etc. The table **3300** indicates a criteria for scoring each sub parameter and score calculation for each sub parameter.

[0280] Referring now to FIG. **34**, a table **3400** of mind parameter scoring is shown, according to an exemplary embodiment. The table **3400** can indicate scoring for mind parameters **622**. The table **3400** indicates sub parameters for the presence and/or absence of services of the building **146**, e.g., mental health awareness, access to organization (e.g., a mental health education program), access to suicide prevention resources, and/or access to organization stress management programs, etc. The table **3400** indicates a criteria for scoring each sub parameter and score calculation for each sub parameter.

[0281] Referring now to FIG. **35**, a table **3500** of social parameter scoring is shown, according to an exemplary embodiment. The table **3500** can indicate scoring for social parameters **624**. The table **3500** indicates sub parameters for the presence and/or absence of services of the building **146**, e.g., alerts and notifications of organization social events,

colleague birthday reminders, nearby social events, etc. The table **3500** indicates a criteria for scoring each sub parameter and score calculation for each sub parameter.

[0282] Referring now FIG. **36**, a table **3600** of physical user health parameter scoring is shown, according to an exemplary embodiment. The table **3600** can indicate scoring for physical user health parameters. The table **3600** indicates sub parameters for the presence and/or absence of services of the building **146**, e.g., customized alerts to occupants to low away from a screen, an alert for occupants when a person is less than three feet away from them, a service to update sick leave, contact tracing, a service to handle air replacement requests, alerts or notifications for occupant irregularities in health data, etc. The table **3600** indicates a criteria for scoring each sub parameter and score calculation for each sub parameter.

[0283] Referring now to FIG. **37**, the building health manager **128** generating user interface recommendations is shown, according to an exemplary embodiment. The building health manager **128** can be implemented for a building and/or campus of buildings. In some embodiments, the building health manager **128** can be implemented for one or multiple buildings owned by an entity located in various locations, e.g., a chain of stores. In some embodiments, the building health manager **128** is implemented for the building **146** as described with reference to FIG. **1**.

[0284] The building health manager **128** includes a user interface manager **3700**, an operational service **3704**, and a recommendation engine **3702**. The user interface manager **3700** can be configured to generate and manager various user interfaces, for example, the user interfaces and interface elements. Furthermore, the user interface manager **3700** can provide the user interfaces to the user device **148** and receive user interactions, e.g., selections made via the user interfaces with the user device **148**. The interfaces generated by the user interface manager **3700** can include recommendations generated by the recommendation engine **3702**. User selections to approve or decline recommendations can be communicated to the recommendation engine **3702** by the user interface manager **3700**.

[0285] The recommendation engine **3702** can be configured to receive building data from the operational service **3704**. The building data can be data indicating the performance of the building systems **142** and/or various spaces of a building. The recommendation engine **3702** can perform one or more machine learning and/or artificial intelligence based algorithms to generate recommendations. Furthermore, based on user selections associated with the recommendations, e.g., approving or rejecting a recommendation, the recommendation engine **3702** can perform learning to generate future recommendations. The recommendation engine **3702** can implement various modeling and/or learning algorithms, e.g., neural networks (e.g., recurrent neural networks (RNNs), convolutional neural networks (CNNs), etc.), support vector machines (SVMs), Bayesian networks, a constraint tool model, etc.

[0286] In some embodiments, the recommendation engine **3702** performs learning algorithms based on a persona of a user of the user device **148** (e.g., technician, building manager, tenant, etc.). For example, the persona may indicate the goals and responsibilities of the user. The recommendation engine **3702** can be configured to generate personalized recommendations for each of multiple users based on the persona of each user.

[0287] The operational service 3704 can be configured to collect building data from the building systems 142. Furthermore, the operational service 3704 can be configured to implement control settings for the building systems 142, e.g., execute control algorithms based on the control settings and/or communicate the control settings to the building systems 142. The control settings can be suggested control settings suggested by the recommendation engine 3702 and approved by a user via a user interface generated by the user interface manager 3700.

[0288] Referring now to FIG. 38, a process 3800 of generating user interface recommendations is shown, according to an exemplary embodiment. In some embodiments, the building health manager 128 can be configured to perform some and/or all of the process 3800.

[0289] In step 3802, the building health manager 128 can receive building data from the building systems 142. The building data can indicate energy usage, runtime information, zone temperatures, and/or any other measured characteristic or operating parameter of the building systems 142.

[0290] In step 3804, the recommendation engine 3702 generates a recommendation to update control of the building systems 142. The recommendation may be a recommendation to change a control setting of the building systems 142. The recommendation may be to perform maintenance on the building systems 142.

[0291] In step 3806, the user interface manager 3700 generates a user interface that organizes the recommendations generated in the step 3804 and causes a display device of the user device 148 to display the interfaces. The user interface can organize the recommendations according to categories. For example, the user interface can organize the recommendations based on whether the recommendations improve employee productivity (e.g., optimize a space, create comfortable temperature or humidity for the space, etc.), improve space utilization (e.g., optimizes a space), result in energy efficiency (e.g., e.g., optimize the performance of equipment), and/or relate to asset upkeep (e.g., maintenance of building equipment, implement control settings that improve equipment life, etc.).

[0292] In step 3808, the user interface manager 3700 can receive a selection of one of the recommendations of the interface generated in the step 3806 and a command to approve the one of the recommendations. The recommendation selected and approved by the user via the user device 148 can include one or more recommended control settings for the building systems 142. In step 3810, the operational service 3704 operates the building systems 142 based on the updated control settings.

[0293] Referring generally to FIGS. 39-48, interfaces are shown that can be generated, managed, and controlled by building health manager 128. All of the interfaces shown and described herein can be generated, managed, and controlled by the building health manager 128. The building health manager 128 can cause the user device 148 (a display device of the user device 148) to display the interfaces and receive user input via the interfaces. The building health manager 128 can generate all of the scoring, alert, and recommendation information of the interfaces of FIGS. 39-48.

[0294] Referring now to FIG. 39, a building health interface 3900 for a group of buildings is shown, according to an exemplary embodiment. The interface 3900 includes an element 3902 for healthy building scores for an enterprise (e.g., a group of buildings). The element 3902 can include an

overall health score, a people health score for the people health parameters 306, a places health score for the space health parameters 304, and a planet health score for the planet health parameters 302. Colors, e.g., red, yellow, or green can be used to represent poor, moderate, or good performance of the various cores. In some embodiments, the score ranges for each parameter can be customized by a user.

[0295] The interface 3900 includes a score history element 3906. The element 3906 includes trends for the scores of the element 3902. The element 3902 includes a month by month trend for an overall health score, a people health score of the people health parameters 306, a places health score for the space health parameters 304, and a planet health score for the planet health parameters 302.

[0296] The element 3904 indicates buildings that need the most attention. The element 3904 includes a list of buildings in a particular filtered order. The order may be lowest overall score to highest overall score or highest overall score to lowest overall score. The list can further indicate overall scores for each building, people scores for each building, places scores for each building, and/or planet health scores for each building. Responsive to interacting with buildings in the element 3904, another interface can be displayed for the building interacted with (e.g., the interface 4000 of FIG. 40).

[0297] The interface 3900 includes an element 3908. The element 3908 includes alerts for the buildings. The element 3908 includes alerts such as poor air quality, cold spaces affecting comfort, high energy use, low hand washing score, and/or workspaces that need cleaning. Furthermore, the element 3908 includes an impact for each alert, e.g., an indication of how many score points for the overall score. Furthermore, the element 3908 includes recommendations for addressing each alert.

[0298] Referring now to FIG. 40, a building health interface 4000 for one building of the group of buildings discussed with reference to the interface 3900 of FIG. 39, according to an exemplary embodiment. The building health interface 4000 includes the same information described in FIG. 39 but instead of being for a group of buildings, the building health interface 4000 is for one selected building. The element 4002 includes an overall health score, a people health score, a places health score, and a planet health score for the one building. Similarly, the element 4006 includes trends of overall health, people health scores, place health scores, and/or planet health scores for one building.

[0299] The element 4004 includes various spaces of the one building ordered from lowest overall space score to highest overall space score. The element 4004 includes the spaces in a list with indications of overall score, people score, places score, and planet score for each space. Furthermore, the interface 4000 includes an element 4008 including alerts for various spaces of the one building, an impact of each alert, and a recommendation for addressing each alert.

[0300] Referring now to FIG. 41, is a schematic drawing of a people health information interface 4100 of the one building of the group of buildings of FIG. 40, according to an exemplary embodiment. The building health manager 128 can generate similar interfaces for the planet health parameters 302 and/or the space health parameters 304. The interface 4100 includes an element 4102 indicating a people health score for the building for the people health parameters 306. The element 4104 includes an element 4104 for the

security parameter **606** indicating a score for the security parameter **606**, total alerts for the parameter **606**, and indications of each alert category, score, and number of alerts in each category.

[0301] The interface **4100** includes an element **4106** indicating alerts that impact the people health parameters **306**. The interface **4100** includes an element **4108** indicating scores and alerts for the wellness parameters **608**. The interface **4100** includes an element **4110** indicating scores and alerts for the cleanliness and anti-infection parameters **610**. The interface **4100** includes an element **4112** indicating scores and alerts for the air quality parameters **602**. The interface **4100** includes an element **4114** indicating scores and alerts for the ergonomics parameters **604**.

[0302] Referring now to FIG. **42**, a process **4200** of closed-loop operation for implementing recommendations based on health scores of the user interfaces of FIGS. **43-46** is shown, according to an exemplary embodiment. The process **4200** shows the effects a recommendation would have on multiple factors. These factors relate to planet health parameters **302**, the people health parameters **306**, and/or the space health parameters **304** but also to the monetary costs and/or savings that result from implementing a recommendation. The process **4200** provides a feedback loop for continuous improvement of a space, building, and/or group of buildings, i.e., a user reviews scores and implements recommendations to improve said scores which are again reviewed by the user and further recommendations may be implemented.

[0303] The process **4200** includes a step **4202** where the building health manager **128** displays an interface including alerts and recommendations, e.g., the interface **4000** shown in FIG. **43**. The recommendations can be selectable by a user, i.e., in step **4208** a user can select one alert of the alerts. For example, in the interface **4000** in FIG. **43**, a poor air quality alert is selected.

[0304] In step **4204**, the building health manager **128** can display a space performance interface, e.g., the interface **4400** shown in FIG. **44**. The interface **4400** can provide information on infection risk and air quality for the space that the selected alert is occurring in. In step **4210**, the building health manager **128** receives a selection to view recommendations of the space. In step **4206**, the building health manager **128** displays recommendations for the space via a user interface, e.g., the interface **4600** of FIGS. **46A-B**.

[0305] A user can provide input to the user interface **4600** selecting one recommendation of the recommendations of the interface **4600** (step **4212**). The selection can cause the building health manager **128** to implement operating commands for the recommendation and operate the building systems **142** based on the operating commands. The resulting operation updates cause changes to the operation of the building which in turn can reflect changes to the overall building score, the score of the planet health parameters **302**, the scores of the people health parameters **306**, and/or the scores of the space health parameters **304**. This can result additional changes made by the user to implement other recommendations or control updates, this can form a closed-loop operation of the building with the health scores.

[0306] Referring now to FIG. **43**, a schematic drawing of the building health interface **4000** of FIG. **40** where a user selects an air quality alert with an associated recommendation is shown, according to an exemplary embodiment. In

FIG. **43**, a user selects one alert of the alerts of the element **4008** with selection **4302**. In selection **4302**, a poor air quality alert is selected.

[0307] Referring now to FIG. **44**, an interface **4400** showing air quality information displayed responsive to selecting the air quality alert of FIG. **43** is shown, according to an exemplary embodiment. The interface **4400** includes an element **4402** providing scores for infectious disease risk and indoor air quality for a particular building. The interface **4400** further includes an element **4404** providing a space utilization of the particular building. The element **4404** indicates a total percentage utilization of the building, a current occupancy of the building, a total occupant capacity of the building, and an indication of a number of unassigned spaces.

[0308] The element **4406** indicates infection risk and air quality for a particular space of a particular floor of the building. The element **4406** includes an infectious disease risk score and an indoor air quality risk score for the space. Current operating parameters for the space are further shown in the element **4406**, airflow parameters (e.g., clean air deliver, minimum ventilation), comfort parameters (e.g., supply air temperature setpoint, humidity), ultraviolet (UV) disinfection parameters (e.g., a binary indication of perform system UV disinfection and/or in-zone UV disinfection), an air quality parameter (e.g., CO₂, PM_{2.5}, PM₁₀, VOC, etc.), and/or filtration parameters (e.g., system air filtration, in-zone air filtration, etc.).

[0309] The element **4406** further shows an energy cost for the space and a floor plan indicating where the space is located on a particular floor. The element **4406** includes a view recommendations element to view recommendations for improving the infectious disease risk score and/or the indoor air quality score.

[0310] Referring now to FIGS. **45A-B**, an interface **4500** showing infectious disease related risk information and recommendations is shown, according to an exemplary embodiment. The interface **4500** can be another version of the interface **4400**. The interface **4500** includes an element **4502** indicating an infectious disease risk score and an indoor air quality score for a building. Furthermore, the element **4504** of the interface **4500** indicates a total occupant utilization of the space. The interface **4500** further includes an element **4506** providing alerts for various areas of the building pertaining to an infectious disease risk. The interface **4500** further includes an element **4508** providing alerts for various areas of the building pertaining to low indoor air quality.

[0311] The element **4510** of the interface **4500** includes indications of information for one of multiple selected areas of the building. The element **4510** includes a floor map indicating a floor and an indication of the selected space on the floor map. The element **4510** further includes an infectious disease risk score for the selected space, an indoor air quality score for the selected space, and an energy cost for the selected space. Furthermore, the element **4510** further includes indications of operating parameters for the selected space. The operating parameters can be airflow parameters (e.g., clean air delivery level, minimum ventilation level), comfort parameters (e.g., supply air temperature setpoint, humidity), UV disinfection parameters (e.g., system UV disinfection, in-zone UV disinfection), filtration parameters

(e.g., system air filtration, in-zone air filtration), and/or air quality parameters (e.g., temperature, CO₂, PM_{2.5}, PM₁₀, VOC).

[0312] Referring now to FIGS. 46A-B, an interface 4600 including recommendations addressing infectious disease transmission risk is shown, according to an exemplary embodiment. The interface 4600 includes a current state element 4602. The element 4602 indicates current conditions of a building and/or space. The element 4602 indicates a current infectious disease risk score and a current indoor air quality score. Furthermore, the element 4602 indicates a current monthly energy cost for the building or space. The current values for the operating parameters for air flow, comfort, UV disinfection, air quality, and/or filtration are shown in the element 4602.

[0313] The interface 4600 indicates recommendations 4602 generated by the building health manager 128. The recommendations 4604 includes a recommendation 4606. The recommendation 4606 indicates one option for improving the infectious disease score and/or the indoor air quality score. The recommendation 4606 indicates a prediction of an infectious disease risk score and an indoor air quality score that will result from improved values for the air flow parameters, comfort parameters, UV disinfection parameters, air quality parameters, and/or filtration parameters. The recommendation 4606 includes an accept element that a user can interact with to accept the recommendation 4606 and implement operation of building systems based on the values of the parameters shown in the recommendation 4606. A predicted energy cost is further shown in the recommendation 4606. The predicted energy cost can be a predicted cost of operating at the new parameter values.

[0314] The interface 4600 includes a recommendation 4608. The recommendation 4608 recommends new parameter values for the air flow, comfort, UV disinfection, air quality, and filtration parameters that results in increased infectious disease risk score and the indoor air quality score. The increase in scores for the recommendation 4608 is less than the increase resulting from the recommendation 4606. However, the predicted energy cost of the recommendation 4608 is on budget and is less than the over budget energy cost resulting from the recommendation 4606. The recommendation 4608 includes an element to accept the recommendation 4608 and implement the parameter values of the recommendation 4608.

[0315] In some embodiments, the recommendations 4606 and 4608 are generated based on the recommendation engine 3702 as shown in FIG. 37. The recommendations 4606 and 4608 can be generated by an artificial intelligence and can be generated based on historical user input in order to generate recommendations that meet the goals of a user and/or organization.

[0316] Referring now to FIG. 47, an interface 4700 including recommendations for improving user health scores for a building space is shown, according to an exemplary embodiment. The interface 4700 includes a current state 4702 indicating a current health score, operating settings, and energy cost of the operating settings. The interface 4700 further includes recommendations 4704-4708 which can each include different recommended operating settings, each set of operating settings resulting in a different health score and/or energy cost. Each of the recommendations 4704-4708 include a select element to select and implement said

recommendation. The recommendations 4704-4708 can be generated by the recommendation engine 3702 of FIG. 37.

[0317] Referring now to FIG. 48, a schematic drawing of an interface 4800 including a list of health building recommendations is shown, according to an exemplary embodiment. The interface 4800 can include a list of recommendations generated by the recommendation engine 3702. The recommendation engine 3702 can generate each recommendation to address an alert that has occurred. The alert can be an indication of an event that decreases a health score of the building. For example, alerts can be that an outdoor air temperature is higher than a set amount, physical distancing practices are not being followed, etc.

[0318] The list of the interface 4800 indicates a time that each recommendation was generated, a numerical increase to an overall health score that will result from the recommendation, a category of the recommendation (e.g., air, space, fitness, mechanical maintenance, etc.), a space that the recommendation impacts, etc. The list of the interface 4800 includes a check mark to accept each of the alerts and an "x" mark to reject each of the alerts.

[0319] Referring now to FIG. 49, a command and control interface 4900 where a user can input operating settings for building equipment is shown, according to an exemplary embodiment. The interface 4900 includes command and control for a particular AHU, AHU 1 of a specific zone, floor, building, and campus of an entity. The interface 4900 can provide an input for a user to review and set command and status settings. Furthermore, the interface 4900 allows a user to make a command or set a status indefinitely and/or for a user specified time. The control manager 214 can receive the settings and commands via the interface 4900 and operate the building systems 142 based on the settings and commands.

[0320] Referring now to FIG. 50, a user interface 5000 including recommendations relating to indoor health is shown, according to an exemplary embodiment. The interface 5000 can provide recommendations generated by the recommendation generator 1116. The recommendations of the interface 5000 can be specific to indoor health, e.g., space health scores of the space health parameters 304. The user interface 5000 can present the recommendations in an ordered list with time, expiration time, equipment, space name, observations, recommendations, and a basis for each entry. The user can accept and/or reject each recommendation of the user interface 5000. Responsive to accepting one of the recommendations, the control manager 214 can update operation of the building systems 142 appropriately.

[0321] Referring now to FIG. 51, a user interface 5100 of an audit log of recommendations of the user interface of FIG. 50 is shown, according to an exemplary embodiment. The user interface 5100 can provide a log of accepted and rejected recommendations to enable to review a history of their decisions. For each recommendation, the user interface 5100 can indicate rejected recommendations, accepted recommendations, and whether a user enabled auto-accept features.

[0322] Referring now to FIG. 52, a user interface 5200 including recommendations relating to occupant comfort is shown, according to an exemplary embodiment. The interface 5200 can provide recommendations generated by the recommendation generator 1116. The recommendations of the interface 5200 can be specific to employee comfort, e.g., the occupant health and wellness parameters 404, the ergo-

nomics parameters **604**, and/or the thermal comfort parameter **616**. The user interface **50002** can present the recommendations in an ordered list with time, expiration time, equipment, space name, observations, recommendations, and a basis for each entry. The user can accept and/or reject each recommendation of the user interface **5200**. Responsive to accepting one of the recommendations, the control manager **214** can update operation of the building systems **142** appropriately.

[0323] Referring now to FIG. **53**, a user interface **5300** including recommendations relating to space utilization is shown, according to an exemplary embodiment. The interface **5300** can provide recommendations generated by the recommendation generator **1116**. The recommendations of the interface **5300** can be specific to space utilization, e.g., the resource health and sustainability parameters **402**, the reduce carbon footprint parameters **1004**, and/or the space utilization parameter **1022**, the ergonomics parameters **604**, and/or the thermal comfort parameter **616**. The user interface **5300** can present the recommendations in an ordered list with time, expiration time, equipment, space name, observations, recommendations, and a basis for each entry. The user can accept and/or reject each recommendation of the user interface **5300**. Responsive to accepting one of the recommendations, the control manager **214** can update operation of the building systems **142** appropriately.

[0324] Referring now to FIG. **54**, a user interface **5400** including recommendations relating to energy efficiency is shown, according to an exemplary embodiment. The interface **5400** can provide recommendations generated by the recommendation generator **1116**. The recommendations of the interface **5400** can be specific to space utilization, e.g., the resource health and sustainability parameters **402**, the reduce carbon footprint parameters **1004**, and/or the space utilization parameter **1022**, the ergonomics parameters **604**, and/or the thermal comfort parameter **616**. The user interface **5400** can present the recommendations in an ordered list with time, expiration time, equipment, space name, observations, recommendations, and a basis for each entry. The user can accept and/or reject each recommendation of the user interface **5400**. Responsive to accepting one of the recommendations, the control manager **214** can update operation of the building systems **142** appropriately.

[0325] Referring now to FIG. **55**, a user interface **5500** including recommendations relating to asset upkeep is shown, according to an exemplary embodiment. The interface **5500** can provide recommendations generated by the recommendation generator **1116**. The recommendations of the interface **5500** can be specific to asset upkeep, e.g., the safety and security health parameters **405**. The user interface **5500** can present the recommendations in an ordered list with time, expiration time, equipment, space name, observations, recommendations, and a basis for each entry. The user can accept and/or reject each recommendation of the user interface **5500**. Responsive to accepting one of the recommendations, the control manager **214** can update operation of the building systems **142** appropriately.

[0326] Referring now to FIGS. **56A-B**, a user interface **5600** including indoor health recommendations, employee productivity recommendations, space utilization recommendations, energy efficiency recommendations, and asset upkeep recommendations, according to an exemplary embodiment. The user interface **5600** can be a composite user interface that incorporates all of the information of the

user interfaces FIG. **50-FIG. 55**. The user interface **5600** can be provided via an email or via a smartphone.

[0327] The user interface **5600** includes various recommendations for indoor health in indoor health element **5602**, e.g., recommendations for improving scores pertaining to the space health parameters **304**. The user interface **5600** includes various recommendations for employee productivity in employee productivity element **5604**, e.g., recommendations for improving scores pertaining to the occupant health and wellness parameters **404**, the ergonomics parameters **604**, and/or the thermal comfort parameter **616**. The user interface **5600** includes various recommendations for space utilization in space utilization element **5606**, e.g., recommendations for improving scores pertaining to the resource health and sustainability parameters **402**, the reduce carbon footprint parameters **1004**, and/or the space utilization parameter **1022**, the ergonomics parameters **604**, and/or the thermal comfort parameter **616**.

[0328] The user interface **5600** includes various recommendations for energy efficiency in energy efficiency element **5608**, e.g., recommendations for improving scores pertaining to the resource health and sustainability parameters **402**, the reduce carbon footprint parameters **1004**, and/or the space utilization parameter **1022**, the ergonomics parameters **604**, and/or the thermal comfort parameter **616**. The user interface **5600** includes various recommendations for asset upkeep in asset upkeep element **5610**, e.g., recommendations for improving scores pertaining to the safety and security health parameters **405**.

[0329] Referring now to FIG. **57**, a user interface **5700** with a plot of consumption and demand of a building is shown, according to an exemplary embodiment. The user interface **5700** includes an element **5702** providing a plot of energy consumption in kilowatt hours (kWh) for various days. The plot of the element **5702** further provides an occupancy status. The energy consumption of the plot of the element **5702** can be the electrical energy consumption of the building systems **142**. The user interface **5700** includes an element **5704** that provides a plot of a peak (or alternatively minimum, maximum, or average) energy demand in kilowatts (kW) for various days. The plot of the element **5704** can indicate demand of the building systems **142**.

[0330] Referring now to FIG. **58**, a user interface **5800** indicating energy consumption for a space that a user searches for is shown, according to an exemplary embodiment. The user interface **5800** includes a navigation element **5802**. The navigation element **5802** can allow a user to search/navigate to a specific campus, building, and/or space of an entity. Responsive to a user selecting a specific building or space, the user interface **5800** can display the element **5702** specific to the selected building or space, e.g., displaying consumption or demand for the selected building or space.

Configuration of Exemplary Embodiments

[0331] The construction and arrangement of the systems and methods as shown in the various exemplary embodiments are illustrative only. Although only a few embodiments have been described in detail in this disclosure, many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.). For example, the position of elements may be reversed or otherwise varied

and the nature or number of discrete elements or positions may be altered or varied. Accordingly, all such modifications are intended to be included within the scope of the present disclosure. The order or sequence of any process or method steps may be varied or re-sequenced according to alternative embodiments. Other substitutions, modifications, changes, and omissions may be made in the design, operating conditions and arrangement of the exemplary embodiments without departing from the scope of the present disclosure.

[0332] The present disclosure contemplates methods, systems and program products on any machine-readable media for accomplishing various operations. The embodiments of the present disclosure may be implemented using existing computer processors, or by a special purpose computer processor for an appropriate system, incorporated for this or another purpose, or by a hardwired system. Embodiments within the scope of the present disclosure include program products comprising machine-readable media for carrying or having machine-executable instructions or data structures stored thereon. Such machine-readable media can be any available media that can be accessed by a general purpose or special purpose computer or other machine with a processor. By way of example, such machine-readable media can comprise RAM, ROM, EPROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to carry or store desired program code in the form of machine-executable instructions or data structures and which can be accessed by a general purpose or special purpose computer or other machine with a processor. When information is transferred or provided over a network or another communications connection (either hardwired, wireless, or a combination of hardwired or wireless) to a machine, the machine properly views the connection as a machine-readable medium. Thus, any such connection is properly termed a machine-readable medium. Combinations of the above are also included within the scope of machine-readable media. Machine-executable instructions include, for example, instructions and data which cause a general purpose computer, special purpose computer, or special purpose processing machines to perform a certain function or group of functions.

[0333] Although the figures show a specific order of method steps, the order of the steps may differ from what is depicted. Also two or more steps may be performed concurrently or with partial concurrence. Such variation will depend on the software and hardware systems chosen and on designer choice. All such variations are within the scope of the disclosure. Likewise, software implementations could be accomplished with standard programming techniques with rule based logic and other logic to accomplish the various connection steps, processing steps, comparison steps and decision steps.

[0334] In various implementations, the steps and operations described herein may be performed on one processor or in a combination of two or more processors. For example, in some implementations, the various operations could be performed in a central server or set of central servers configured to receive data from one or more devices (e.g., edge computing devices/controllers) and perform the operations. In some implementations, the operations may be performed by one or more local controllers or computing devices (e.g., edge devices), such as controllers dedicated to and/or located within a particular building or portion of a

building. In some implementations, the operations may be performed by a combination of one or more central or offsite computing devices/servers and one or more local controllers/computing devices. All such implementations are contemplated within the scope of the present disclosure. Further, unless otherwise indicated, when the present disclosure refers to one or more computer-readable storage media and/or one or more controllers, such computer-readable storage media and/or one or more controllers may be implemented as one or more central servers, one or more local controllers or computing devices (e.g., edge devices), any combination thereof, or any other combination of storage media and/or controllers regardless of the location of such devices.

What is claimed:

1. A building system of a building including one or more storage devices storing instructions thereon that, when executed by one or more processors, cause the one or more processors to:

receive building data from one or more building systems of the building;

cause a display device to display, based on the building data, one or more building scores of the building based on at least one of one or more space parameters indicating health levels of spaces of the building, one or more planet health parameters relating to an effect of the building on environmental pollution, or one or more people parameters relating to at least one of physical or mental health of occupants of the building;

generate one or more recommendations for improving the one or more building scores, the one or more recommendations including a prediction of an increase to a level of the one or more building scores or a decrease to the level of the one or more building scores expected to result from implementation of the one or more recommendations; and

cause the display device to display the one or more recommendations and receive, via the display device, a selection of one recommendation of the one or more recommendations via the display device from the user.

2. The building system of claim 1, wherein the instructions cause the one or more processors to:

operate the one or more building systems based on one or more operating settings of the one recommendation;

receive second building data resulting from operation of the one or more building systems based on the one or more operating settings of the one recommendation;

generate one or more second building scores with the second building data based on the at least one of one or more space parameters indicating the health levels of spaces of the building, the one or more planet health parameters relating to the effect of the building on environmental pollution, or the one or more people parameters relating to the at least one of physical or mental health of occupants of the building; and

cause the display device to display the one or more second building scores.

3. The building system of claim 1, wherein the instructions cause the one or more processors to:

determine one or more periodic costs resulting from energy consumption resulting from operating the one or more building systems based on the one or more recommendations; and

- cause the display device to display the one or more periodic costs.
4. The building system of claim 1, wherein the instructions cause the one or more processors to:
- generate a user interface including:
 - the one or more recommendations, one or more costs from energy consumption resulting from the one or more recommendations, and particular operating settings for the one or more recommendations; and
 - a current operating state of the building, a current monthly financial cost, and one or more current operating settings; and
 - cause the display device to display the user interface.
5. The building system of claim 1, wherein the one or more recommendations comprise a first recommendation and a second recommendation;
- wherein the first recommendation includes one or more first proposed settings for one or more operating settings;
 - wherein the second recommendation includes one or more second proposed settings for the one or more operating settings.
6. The building system of claim 1, wherein the instructions cause the one or more processors to:
- generate a people health score with the building data based on the one or more people parameters relating to the at least one of physical or mental health of occupants of the building;
 - generate a space health score with the building data based on the one or more space parameters indicating the health levels of spaces of the building;
 - generate a planet health score with the building data based on the one or more planet health parameters relating to the effect of the building on environmental pollution;
 - generate an overall health score based on the people health score, the space health score, and the planet health score;
 - generate an interface comprising the people health score, the space health score, the planet health score, and the overall health score; and
 - cause the display device to display the interface.
7. The building system of claim 6, wherein the instructions cause the one or more processors to:
- generate a trend element, the trend element including a trend of at least one of the people health score, the space health score, the planet health score, or the overall health score over a time period; and
 - cause the interface to include the trend element.
8. The building system of claim 6, wherein the instructions cause the one or more processors to:
- generate a list of buildings based on a specific overall health score for each of a plurality of buildings, the list of buildings listing the plurality of buildings from lowest overall health score to highest overall health score; and
 - cause the interface to include the list of buildings.
9. The building system of claim 6, wherein the instructions cause the one or more processors to:
- identify a plurality of alerts indicating issues occurring at the building, the plurality of alerts impacting the overall health score by a particular amount and reducing the overall health score; and
 - cause the interface to include the plurality of alerts and the particular amount impacting the overall health score.
10. The building system of claim 6, wherein the instructions cause the one or more processors to:
- receive a first selection, via the display device, of a first element associated with the people health score;
 - cause the display device to display a plurality of sub-scores of the people health score in response to receiving the first selection, wherein the people health score is based on the plurality of sub-scores of the people health score;
 - receive a second selection, via the display device, of a second element associated with the space health score;
 - cause the display device to display a plurality of sub-scores of the space health score in response to receiving the second selection, wherein the space health score is based on the plurality of sub-scores of the space health score;
 - receive a third selection, via the display device, of a third element associated with the planet health score; and
 - cause the display device to display a plurality of sub-scores of the planet health score in response to receiving the second selection, wherein the planet health score is based on the plurality of sub-scores of the planet health score.
11. A method comprising:
- receiving, by a processing circuit, building data from one or more building systems of a building;
 - causing, by the processing circuit, a display device to display, based on the building data, one or more building scores of the building based on at least one of one or more space parameters indicating health levels of spaces of the building, one or more planet health parameters relating to an effect of the building on environmental pollution, or one or more people parameters relating to at least one of physical or mental health of occupants of the building;
 - generating, by the processing circuit, one or more recommendations for improving the one or more building scores, the one or more recommendations including a prediction of an increase to a level of the one or more building scores or a decrease to the level of the one or more building scores expected to result from implementation of the one or more recommendations; and
 - causing, by the processing circuit, the display device to display the one or more recommendations and receive, via the display device, a selection of one recommendation of the one or more recommendations via the display device from the user.
12. The method of claim 11, further comprising:
- operating, by the processing circuit, the one or more building systems based on one or more operating settings of the one recommendation;
 - receiving, by the processing circuit, second building data resulting from operation of the one or more building systems based on the one or more operating settings of the one recommendation;
 - generating, by the processing circuit, one or more second building scores with the second building data based on the at least one of one or more space parameters indicating the health levels of spaces of the building, the one or more planet health parameters relating to the effect of the building on environmental pollution, or the one or more people parameters relating to the at least one of physical or mental health of occupants of the building; and

causing, by the processing circuit, the display device to display the one or more second building scores.

13. The method of claim **11**, further comprising: determining, by the processing circuit, one or more periodic costs resulting from energy consumption resulting from operating the one or more building systems based on the one or more recommendations; and

causing, by the processing circuit, the display device to display the one or more periodic costs.

14. The method of claim **11**, further comprising:

generating, by the processing circuit, a user interface including:

the one or more recommendations, one or more periodic costs resulting from energy consumption resulting from the one or more recommendations, and particular operating settings for the one or more recommendations; and

a current operating state of the building, a current monthly financial cost, and one or more current operating settings; and

causing, by the processing circuit, the display device to display the user interface.

15. The method of claim **11**, wherein the one or more recommendations comprise a first recommendation and a second recommendation;

wherein the first recommendation includes one or more first proposed settings for one or more operating settings;

wherein the second recommendation includes one or more second proposed settings for the one or more operating settings.

16. The method of claim **11**, further comprising:

generating, by the processing circuit, a people health score with the building data based on the one or more people parameters relating to the at least one of physical or mental health of occupants of the building;

generating, by the processing circuit, a space health score with the building data based on the one or more space parameters indicating the health levels of spaces of the building;

generating, by the processing circuit, a planet health score with the building data based on the one or more planet health parameters relating to the effect of the building on environmental pollution;

generating, by the processing circuit, an overall health score based on the people health score, the space health score, and the planet health score;

generating, by the processing circuit, an interface comprising the people health score, the space health score, the planet health score, and the overall health score; and

causing, by the processing circuit, the display device to display the interface.

17. The method of claim **16**, further comprising:

generating, by the processing circuit, a trend element, the trend element including a trend of at least one of the

people health score, the space health score, the planet health score, or the overall health score over a time period; and

causing, by the processing circuit, the interface to include the trend element.

18. The method of claim **16**, further comprising:

generating, by the processing circuit, a list of buildings based on a specific overall health score for each of a plurality of buildings, the list of buildings listing the plurality of buildings from lowest overall health score to highest overall health score; and

causing, by the processing circuit, the interface to include the list of buildings.

19. The method of claim **16**, further comprising:

identifying, by the processing circuit, a plurality of alerts indicating issues occurring at the building, the plurality of alerts impacting the overall health score by a particular amount and reducing the overall health score; and

causing, by the processing circuit, the interface to include the plurality of alerts and the particular amount impacting the overall health score.

20. A building system of a building including:

one or more storage devices storing instructions thereon; and

one or more processors configured to execute the instructions that cause the one or more processors to:

receive building data from one or more building systems of the building;

cause a display device to display, based on the building data, one or more building scores of the building based on at least one of one or more space parameters indicating health levels of spaces of the building, one or more planet health parameters relating to an effect of the building on environmental pollution, or one or more people parameters relating to at least one of physical or mental health of occupants of the building;

generate one or more recommendations for improving the one or more building scores, the one or more recommendations including a prediction of an increase to a level of the one or more building scores or a decrease to the level of the one or more building scores expected to result from implementation of the one or more recommendations;

cause the display device to display the one or more recommendations and receive, via the display device, a selection of one recommendation of the one or more recommendations via the display device from the user; and

operate the one or more building systems based on one or more operating settings of the one recommendation.

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