BUILDING REPORTS UNIVERSITY

Fire & Life Safety Inspection

BENCHMARK REPORT 2021

2021

Key performance benchmarks for fire, life safety, security, sprinkler, and suppression inspections analyzing data collected from year 2000 through the 2021 calendar year.

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Letter from the President & CTO

Friends & Colleagues,

We are pleased to present the seventh edition of the ***BuildingReports® Fire & Life Safety Inspection Benchmark Report***, which provides analysis and insight on compliance inspection data from the world's largest database of verifiable device inspection data. The analysis within this report provides a high-level summary of fire alarm, life safety, sprinkler, suppression, and security system inspections performed by more than 1,000 organizations over more than two decades.

BuildingReports began providing this analysis in 2014 after reaching the 3 million inspection milestone, which was deemed a sufficient sample size to accurately reflect trends and provide valuable industry insight. At the time of publication in 2022, the data collected from the company's founding in 2000 through the end of the 2021 calendar year now reflects more than 8 million inspections—a growth rate of over 267% in 7-year period.

The report does not include preventative maintenance data collected by leveraging the HVACScan application from BuildingReports. HVACScan is still a relatively new solution, and the sample size is not yet large enough to be statistically relevant.

For those who have read prior editions, the bulk of the report will continue to provide the updated data and statistics on occupancy types, inspection times, failure rates, and failure reasons that you've come to expect. However, one major change first introduced in the 2020 report is a shift in the top and bottom device lists ranking failure rates and average device inspection times. This year, that report section is also now focused on device-level data only from the 2021 calendar year to avoid including outdated technology, such as VCRs.

We hope you find the report useful and informative in your mission to protect both people and property!

Warmest regards,

Jason Kronz
President & CTO, BuildingReports

About BuildingReports

BuildingReports leverages innovative technology and on-demand reporting tools to dramatically improve the building safety inspection process, leading to lower inspection cost and significantly reduced compliance risk. Professionals rely on BuildingReports' easy-to-use mobile barcode scanning tools, online reporting solutions, and field service management tools to properly inspect and maintain critical systems in commercial and industrial facilities.

With BuildingReports' 24/7 access to secure online inspection reports, building owners and AHJs can verify that an inspection was conducted properly and that critical building systems are working in accordance with codes and standards. Building owners can also determine whether actions are required to comply with security standards, thereby reducing risk.

BuildingReports Statistics at Time of Publication:

1,000+
Inspection Partners

1.1+ MILLION
Buildings Inspected

8.7+ MILLION
Inspection Reports

500+ MILLION
Devices Inspected

18+ BILLION SQUARE FEET
of Floorspace Inspected

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Executive Summary

Compiled from the largest database of fire and life safety equipment data in the world, this report examines fire and life safety device inspections—including failure rates and reasons—for facilities across 10 distinct building occupancy types. The devices represented fall into five separate categories by inspection application:

FireScan®
Control equipment, auxiliary functions, initiating devices, monitoring equipment, and notification appliances.

SafetyScan®
Portable fire extinguishers, lighting, personal protective equipment, and safety equipment in any facility.

SecurityScan®
Burglar and security systems, access control, CCTV, and nurse call stations. In recent years, a number of devices specific to financial institution have been added by request, the impact of which will be explained later in the report.

SprinklerScan®
Sprinkler systems, backflow assemblies, fire hydrants, and other water-based fire protection systems.

SuppressionScan®
Clean agent, gas detection, and kitchen hood systems.

The data on the following pages has been collected by BuildingReports' extensive network of over 1,000 inspection, testing, and maintenance (ITM) providers and facility professionals over the past two decades. The seventh edition of the report examines the following:

- What differences between occupancy types and the application of codes and standards does the data from varying industries illustrate?
- What is the benchmark for each industry segment in terms of the time, the number of devices inspected, and the rate at which different device types fail?
- What devices fail, why do they fail, and what trends can we discern?

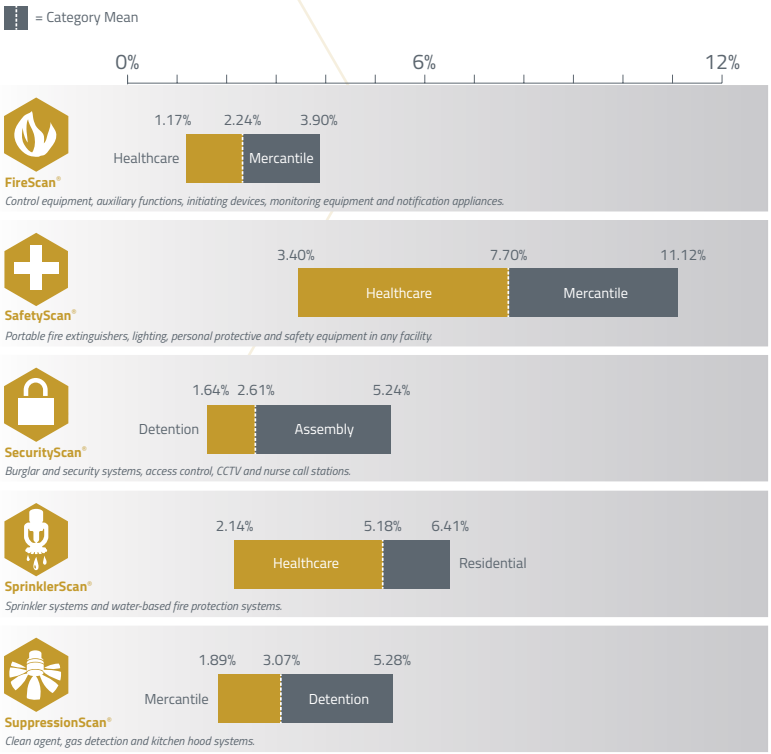
Occupancy Type Performance by Device Category

In this edition of the report, we continue to analyze inspection data for 10 building occupancy classifications:

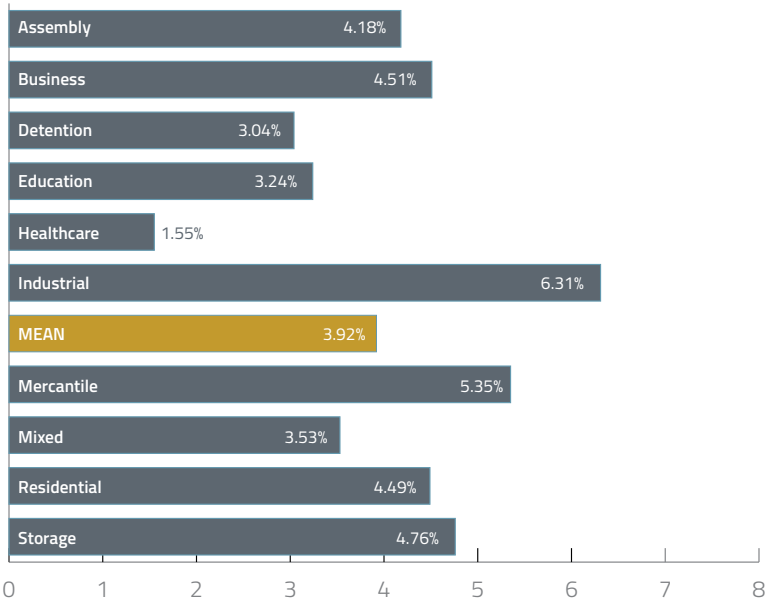
- Assembly
- Business
- Detention
- Educational
- Healthcare
- Industrial
- Mercantile
- Mixed
- Residential
- Storage

Occupancy Type Performance by Device Category

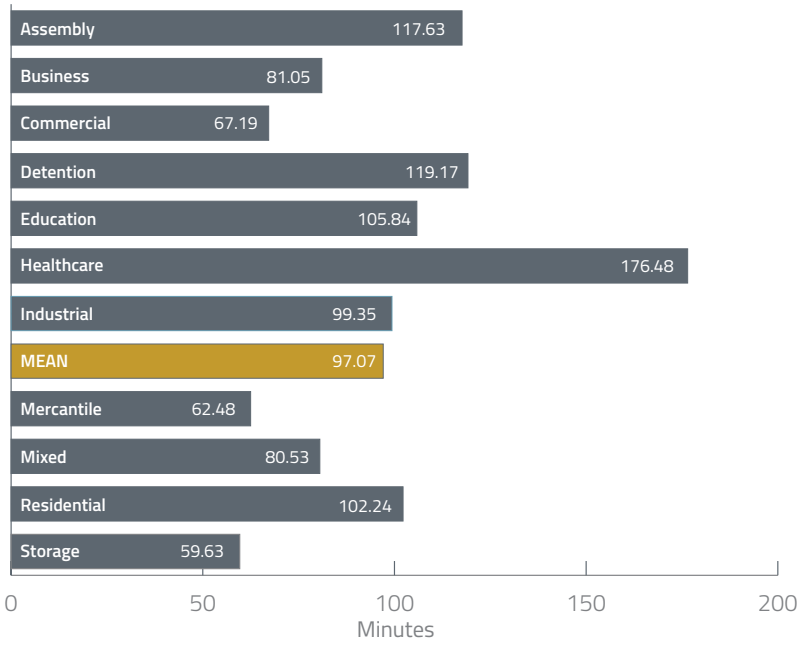
Device Failure Rate & Time Overview



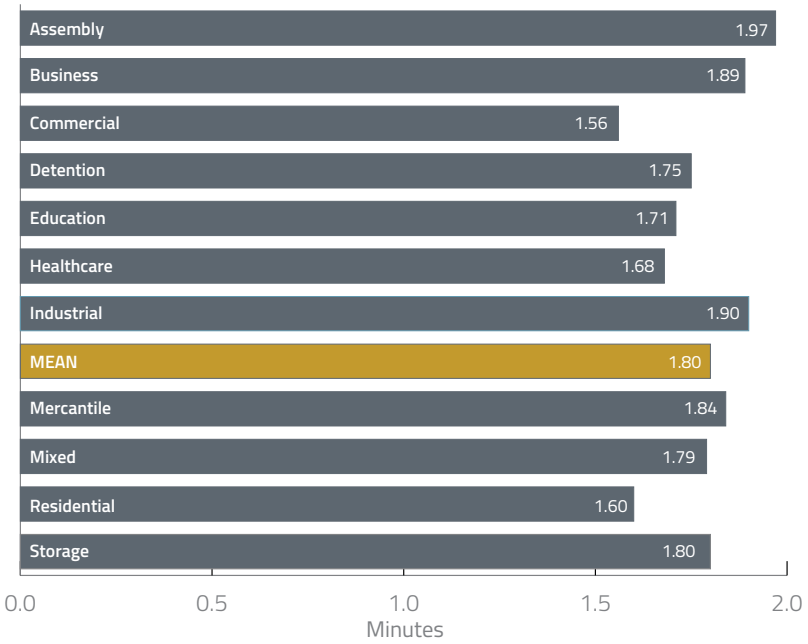
Average Overall Failure Rate by Occupancy Type



Average Total Inspection Time by Occupancy Type (Minutes)



Average Device Inspection Time by Occupancy Type (Minutes)



Failure Rate Key Takeaways

Healthcare occupancy types reported the lowest failure rate across three system types (fire alarm and signaling, life safety, and sprinkler systems) and the lowest overall average failure rate at only 1.55%. Industrial occupancy types reported the highest overall average failure rate at 6.31% but did not claim any of the highest failure rates by system type. On the other hand, Mercantile—which claimed two of the highest failure rates by system type for FireScan (3.90%) and SafetyScan (11.12%)—was the only other occupancy type with an overall average rate over 5% (5.35%).

Inspection Time Key Takeaways

On average, Healthcare facilities took the longest to inspect (176.48 minutes) at more than an hour longer than the second longest, Detention occupancy types (119.17 minutes). Storage (59.63 minutes) and Mercantile (62.48 minutes) occupancy types both averaged averaged around the hour mark. The inspection times reported are based on the time between the first device barcode scanned and the last device barcode scanned during an inspection. These figures do not represent the entire time spent onsite at a facility or the time to travel to/from a facility for the inspection; accordingly, the figures should not be used to estimate the entire length of a service call.

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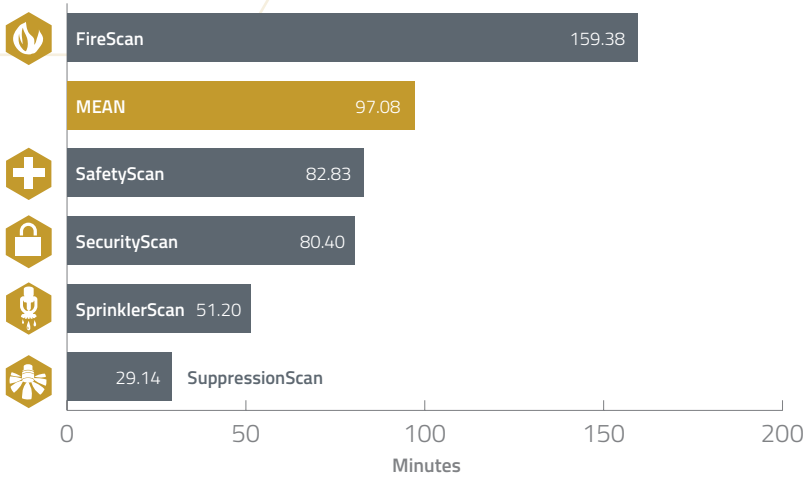
Summaries by Device Type for All Occupancy Types

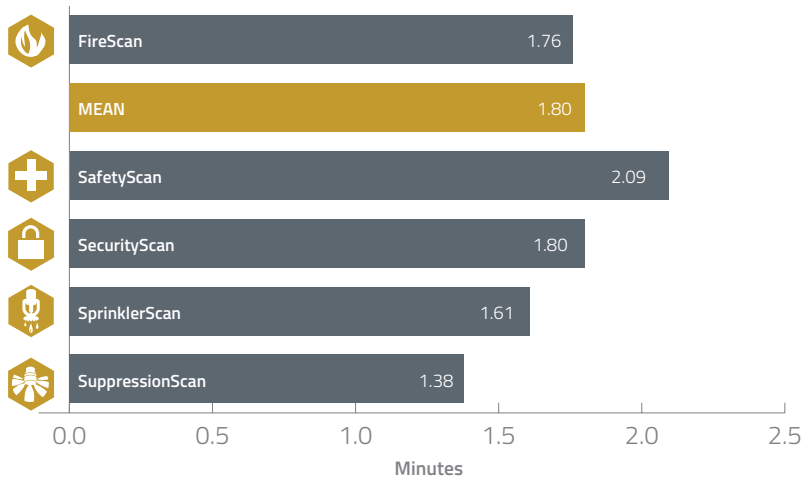
This section focuses on benchmark data across all occupancy types by system type. For more detailed data on specific occupancy types, please refer to section IV—Inspection Times, Failure Rates, & Number of Devices by Occupancy Type.

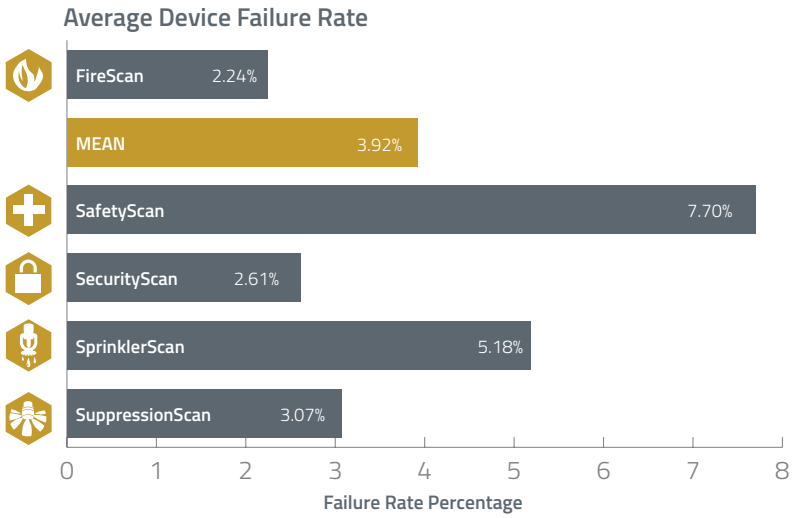
IMPORTANT NOTE: SprinklerScan data does not include all individual sprinkler heads within a facility. BuildingReports' mobile inspection and web-based reporting system does not require every head to be barcoded for scanning and inspection.

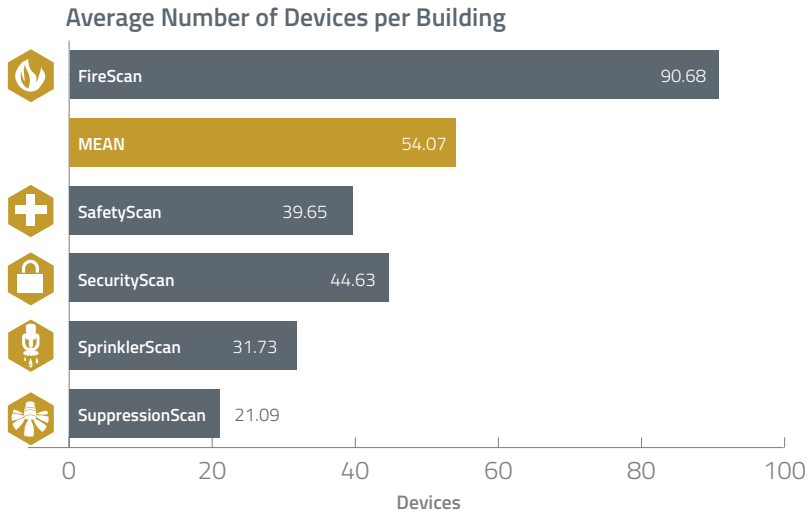
Average Total Inspection Time *(Minutes)*



Average Device Inspection Time *(Minutes)*







Inspection Times & Device Counts

In most cases, the average number of devices per facility by system type correlated to the total overall average inspection time; SafetyScan was the only exception in terms of rankings. This exception appears to be due to SafetyScan life safety devices being the only device type with an average device inspection time of more than 2 minutes. FireScan devices greatly outnumbered the others in average total inspection time (just under 2 hours) and average number of devices per facility (90.68). Conversely, SuppressionScan device types ranked lowest in time metrics (less than 30 minutes total and 1.38 minutes per device) and the number of devices per facility (21.09).

Failure Rates

Once again, SafetyScan devices had the highest failure rate of any device type at 7.70%, or three devices failing per inspection, on average. Using that same logic, FireScan devices had the lowest failure rate at 2.24%, an average of 3.5 failed devices per inspection. SprinklerScan was the only device category with a failure rate over the 3.9% mean. Based on the aggregate analysis since 2014, BuildingReports ScanSeries solution has been used to identify deficiencies in more than 17.5 million critical assets that could have failed in the event of an incident through the end of 2021.

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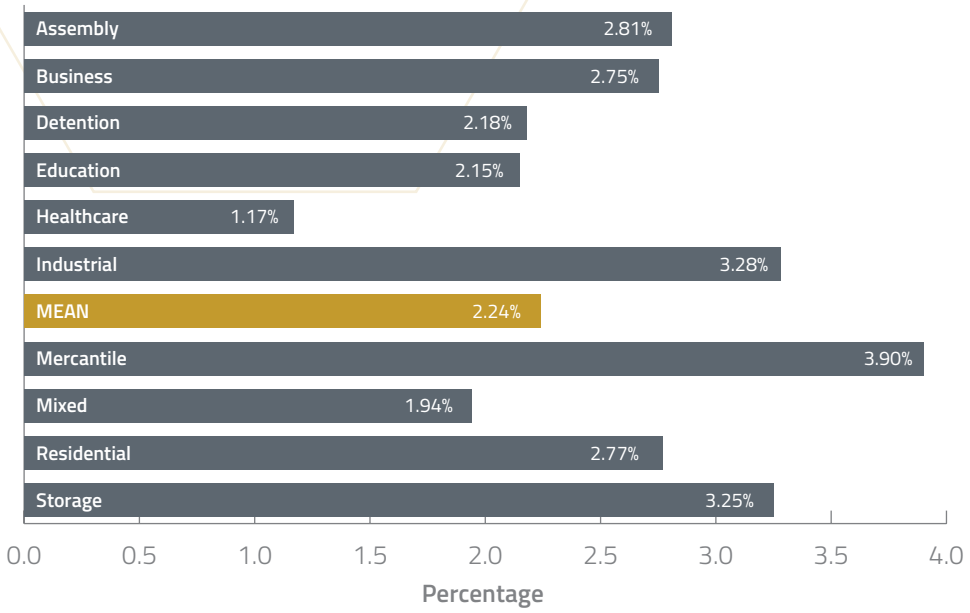
Inspection Times, Failure Rates, & Number of Devices by Occupancy Type

FireScan®

FireScan Average Device Failure Rate by Occupancy Type

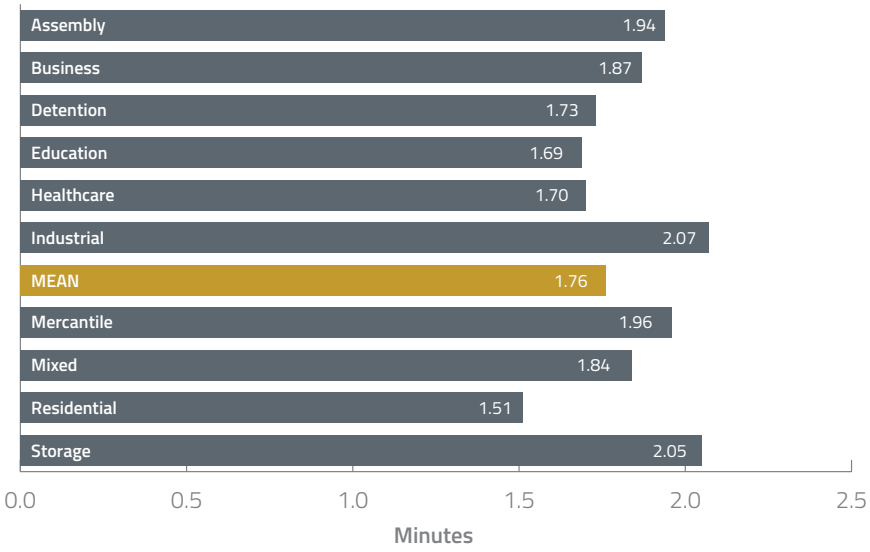


Takeaways

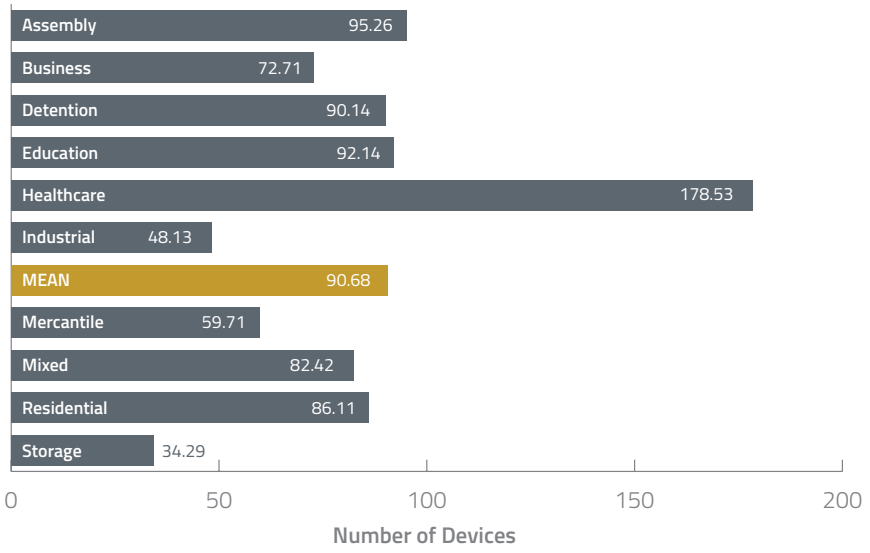
- **Failure Rates:** Healthcare failure rates, the lowest of any occupancy type, continued to fall over time, down from 1.20% in 2020 to only 1.17% in 2021, or 2.09 devices failed per inspection. Similarly, Mercantile continued to report the highest failure rate for the category at 3.90%, with Industrial (3.28%) and Storage (3.25%) as the only other occupancy types over the 3% mark. However, both occupancy types also had the lowest average number of devices per facility, 48.13 and 34.29, respectively. Across all occupancy types, per inspection, 2.03 fire alarm and signaling devices failed to meet code requirements.

- **Time & Quantity:** As in previous reports, Healthcare continued to report the longest average inspection time of any device type at more than 5 hours (303.18 minutes) but also reported the most devices with an average of 178.53 devices per inspection. The next closest device type was Assembly occupancy types, with 95.26 devices and a little more than a 3-hour inspection time. However, the average inspection time per device ranked Healthcare as having the longest (2.07 minutes), while Storage reported an average of 2.05 minutes per device. Assembly reported just under 2 minutes (1.97 minutes) per device but a total average inspection time of only 70.30 minutes, the lowest total average.

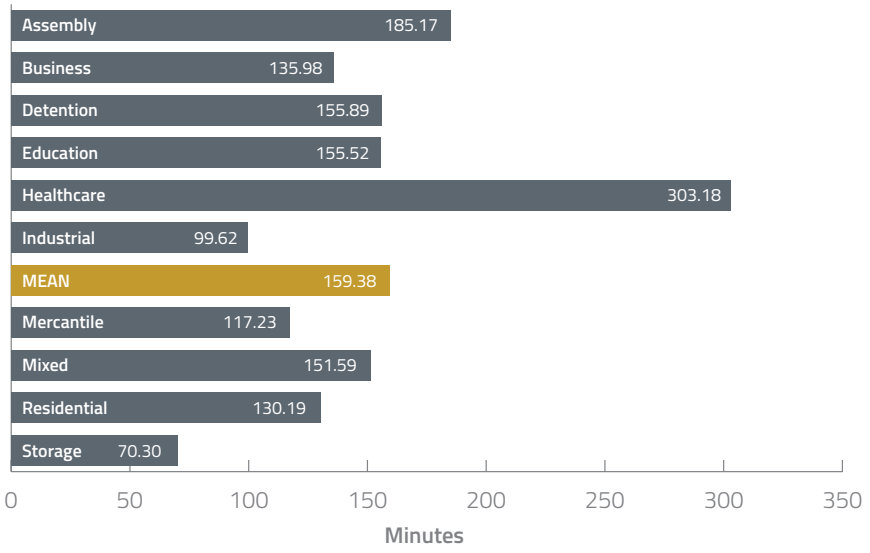
FireScan Average Device Inspection Time by Occupancy Type



FireScan Average Number of Devices per Inspection by Occupancy Type

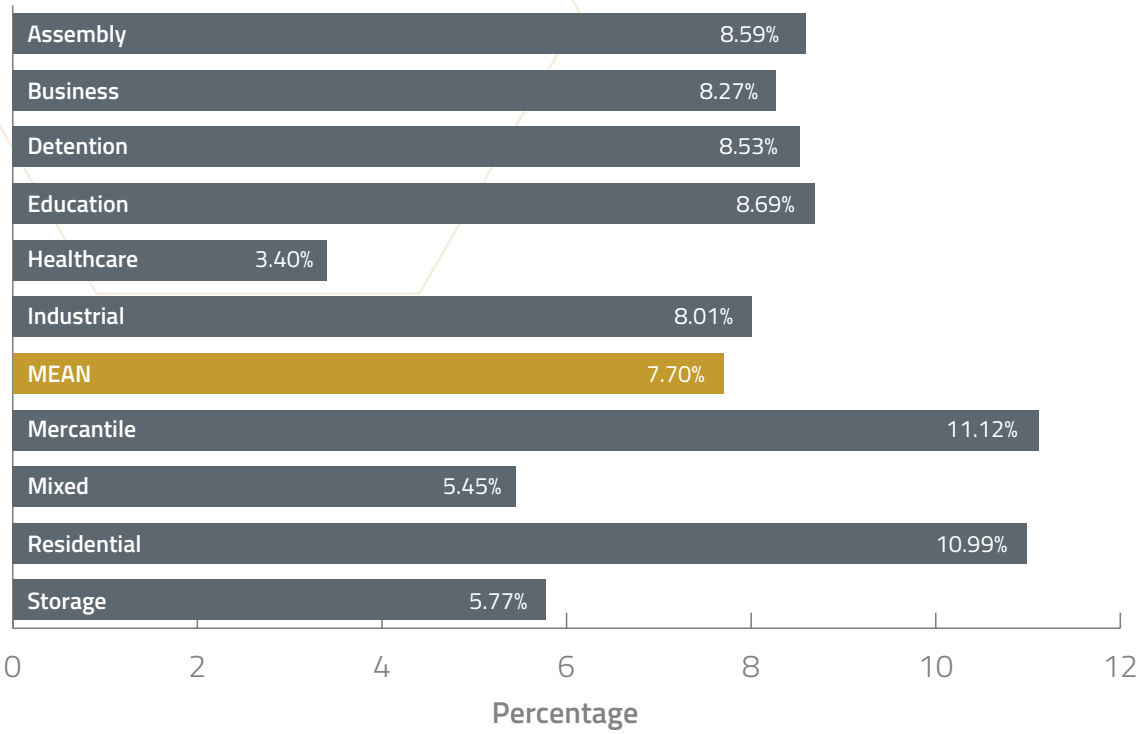


FireScan Average Total Inspection Time by Occupancy Type



SafetyScan®

SafetyScan Average Device Failure by Occupancy Type

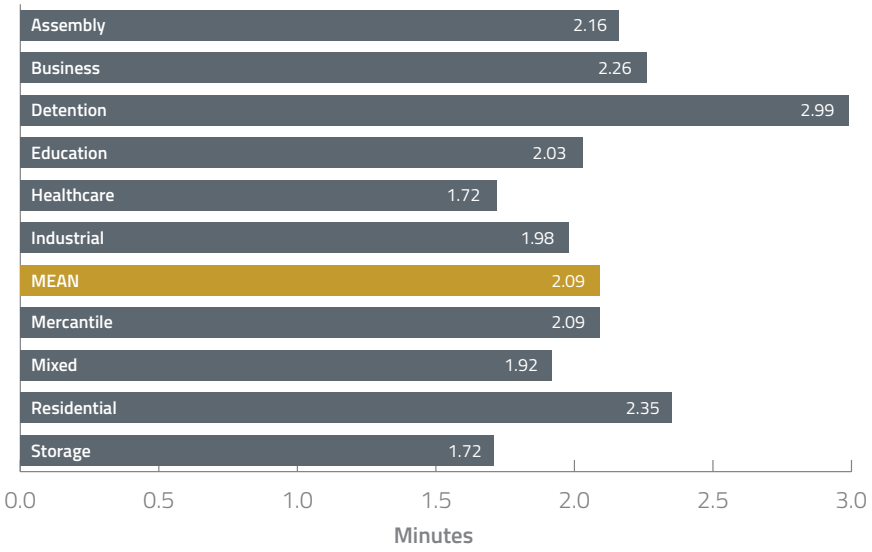


Takeaways

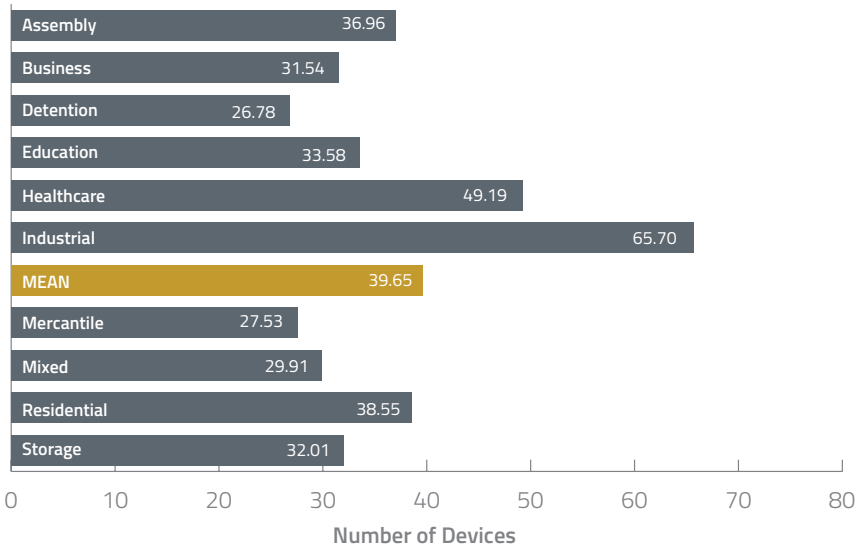
- **Failure Rates:** With an average failure rate more than 4% lower than the category mean, Healthcare occupancy types reported a failure rate of only 3.40%. Mixed Use (5.45%) and Storage (5.77%) reported the second and third lowest failure rates, respectively, both also well below the category mean of 7.70%. Conversely, Mercantile (11.12%) and Residential (10.99%) reported double-digit average failure rates. For Residential, that rate equates to more than four devices per facility failing during inspection and testing.

- **Time & Quantity:** Contrary to FireScan, Healthcare (84.83 minutes) occupancy types ranked third in total average inspection time for SafetyScan, behind only Industrial (129.89 minutes) and Residential (90.52 minutes). However, for the Detention occupancy type, the average inspection time per device was reported as 2.99 minutes, but with averaging just under 30 devices per facility, the total average inspection time for Detention ranked fifth at 79.95 minutes per inspection. Mercantile (57.44 minutes), Mixed Use (57.37 minutes), and Storage reported inspection times at just under an hour, on average.

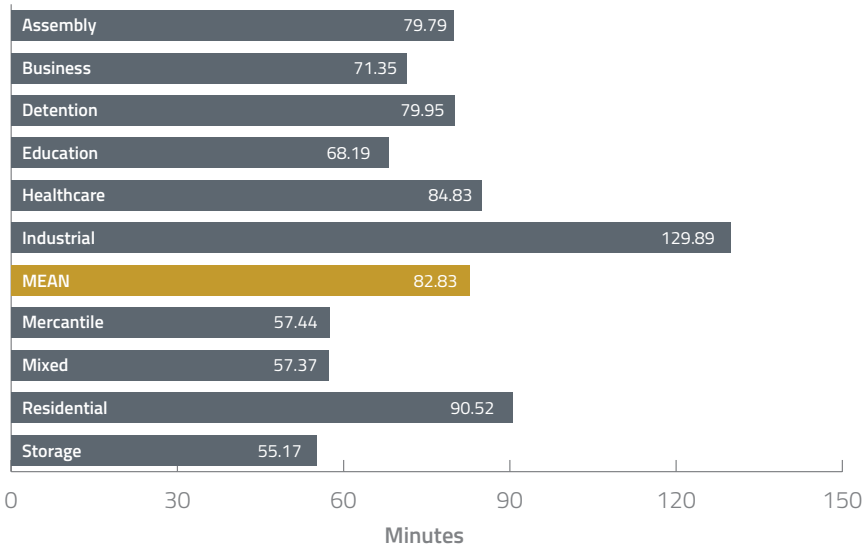
SafetyScan Average Device Inspection Time by Occupancy Type



SafetyScan Average Number of Devices per Inspection by Occupancy Type

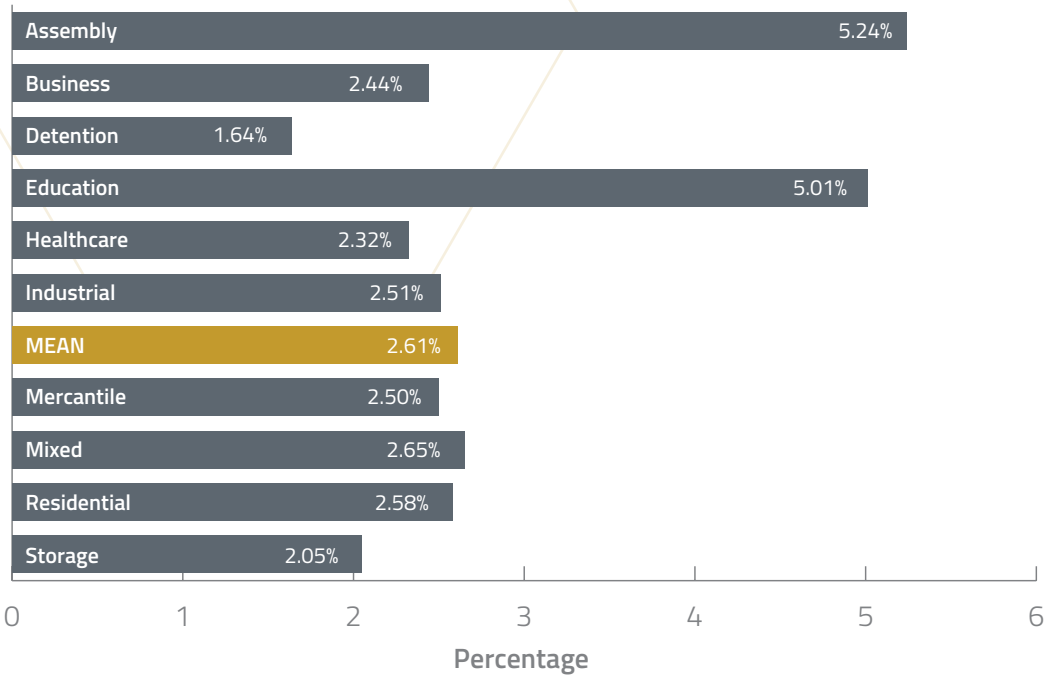


SafetyScan Average Total Inspection Time by Occupancy Type



SecurityScan®

SecurityScan Average Device Failure Rate by Occupancy Type

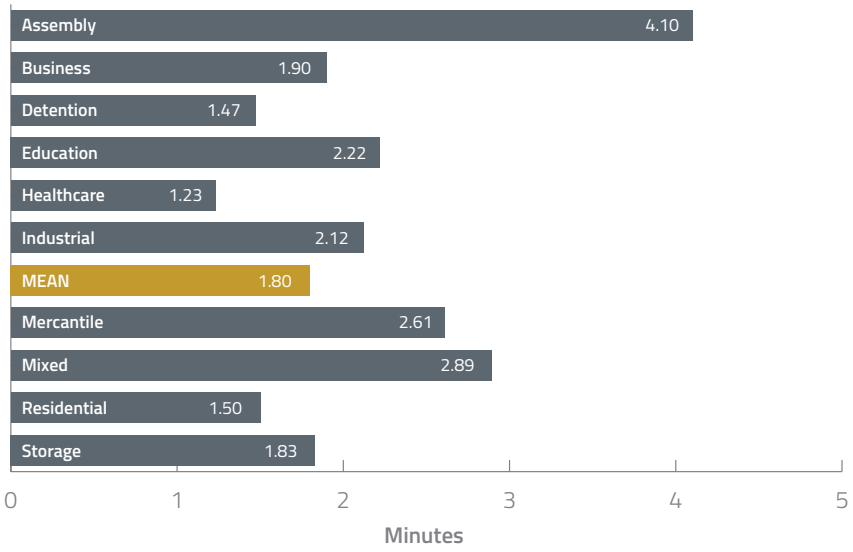


Takeaways

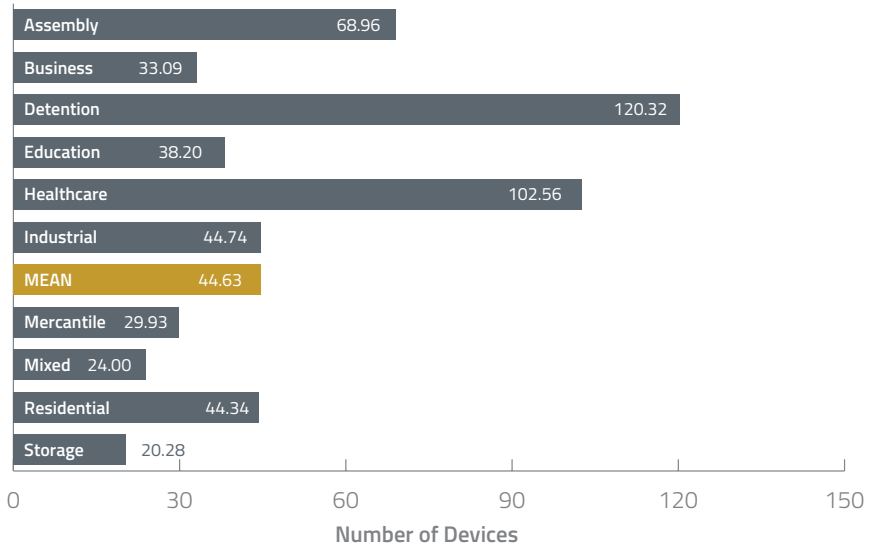
- **Failure Rates:** Assembly (5.24%) and Educational (5.01%) occupancy types stood out with failure rates well above the category mean of 2.61%. Conversely, Detention continued to report the lowest category average at 1.68%, which is unsurprising given the critical importance of security devices in such facilities. Storage occupancy types ranked second lowest at only 2.05%, nearly a half percentage point below the mean.

- **Time & Quantity:** Assembly occupancy types had a total average inspection time of 282.55 minutes—more than three times the category average and significantly higher than the other occupancies. Notably, Assembly Occupancy types also reported the longest average device inspection time at more than 4 minutes per device. This high average inspection time is likely due to the challenges posed by arenas, auditoriums, and other facilities that require special equipment (e.g., lifts) to reach devices. Detention (177.41 minutes) and Healthcare (126.17 minutes) were the only other occupancy types to average more than 2 hours per inspection.

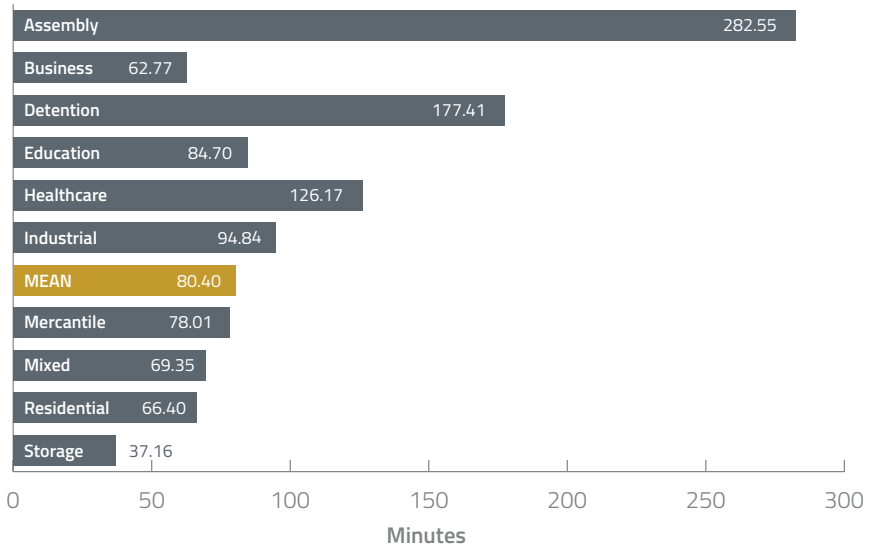
SecurityScan Average Device Inspection Time by Occupancy Type



SecurityScan Average Number of Devices per Inspection by Occupancy Type

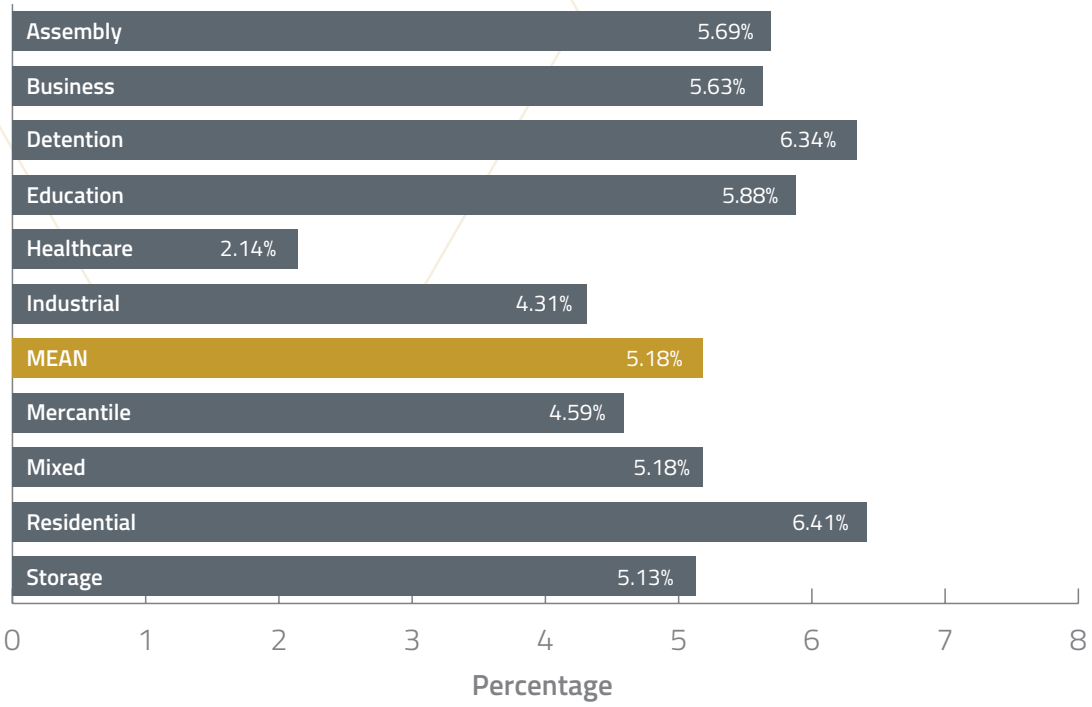


SecurityScan Average Total Inspection Time by Occupancy Type



SprinklerScan®

SprinklerScan Average Device Failure Rate by Occupancy Type

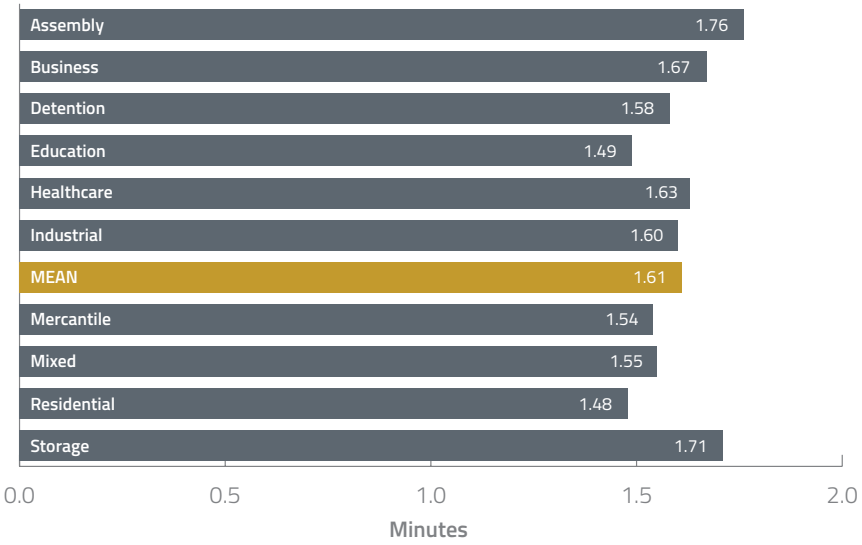


Takeaways

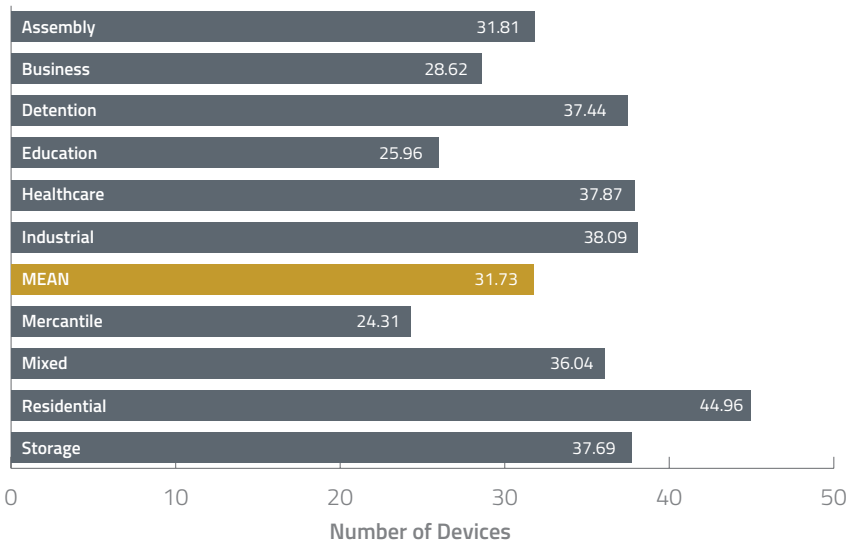
- **Failure Rates:** Healthcare continued to report the lowest average failure rate in the SprinklerScan category at 2.14%, more than 3 percentage points below the mean. Only Residential (6.41%) and Detention (6.34%) reported average failure rates over 6%, with most other occupancy types falling within the 5%–6% range, near the mean of 5.18%. Many of the Residential failures appear to be related to physical damage caused by staff or residents (e.g., due to being painted).

- **Time & Quantity:** Unlike the other device categories, SprinklerScan (and SuppressionScan in the next section) did not have an ocupancy type that took much longer than an hour to inspect, on average. Residential (66.40 minutes), Storage (64.30 minutes), Healthcare (61.69 minutes), and Industrial (60.80 minutes) all reported average inspection times of just over an hour. However, the average inspection time for Residential was just under a minute and a half per device at 1.48 minutes, but reported the highest average device count at 44.96 per facility. Mercantile reported the fewest devices (24.31) and the lowest average inspection time (37.51 minutes) per facility.

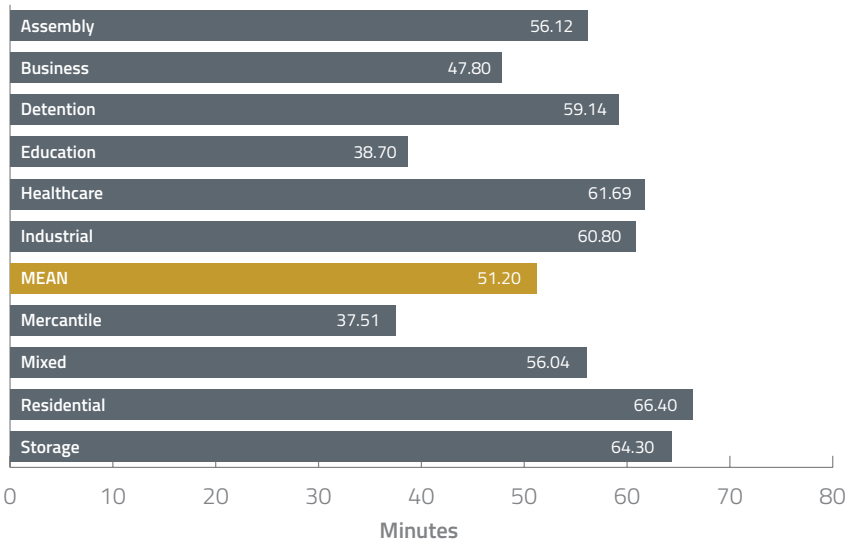
SprinklerScan Average Device Inspection Time by Occupancy Type



SprinklerScan Average Number of Devices per Inspection by Occupancy Type

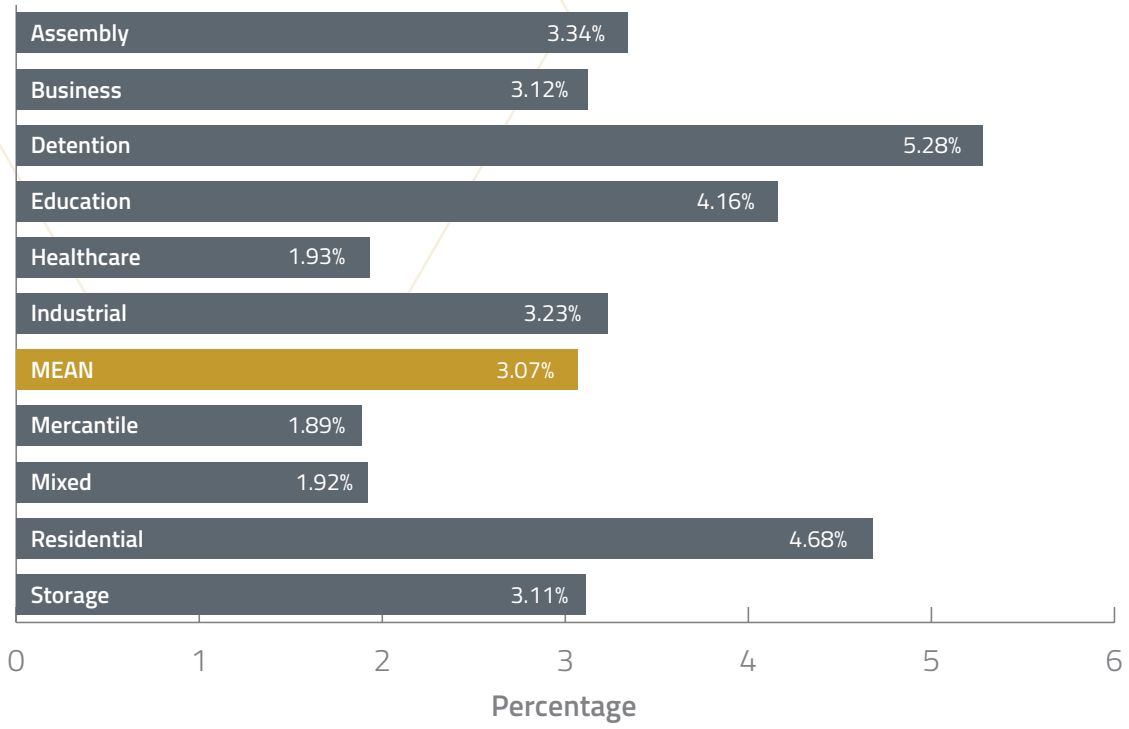


SprinklerScan Average Total Inspection Time by Occupancy Type



SuppressionScan®

SuppressionScan Average Device Failure Rate by Occupancy Type

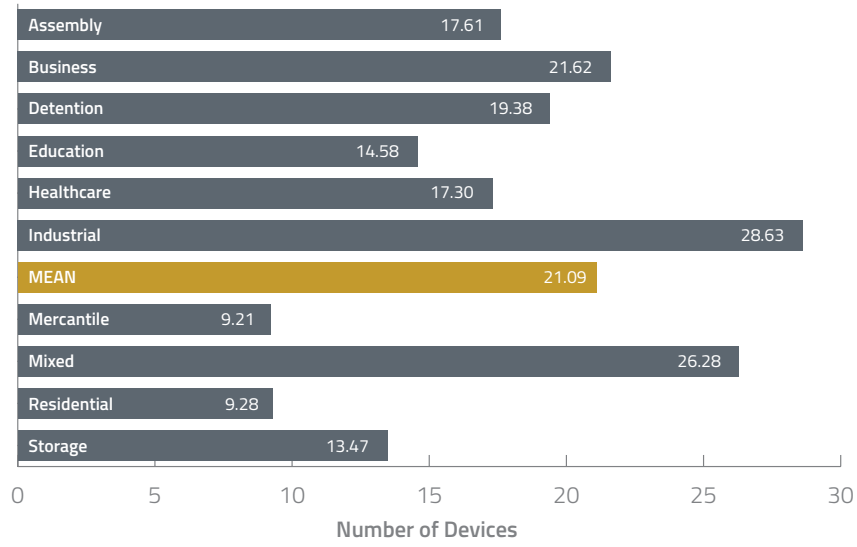


Takeaways

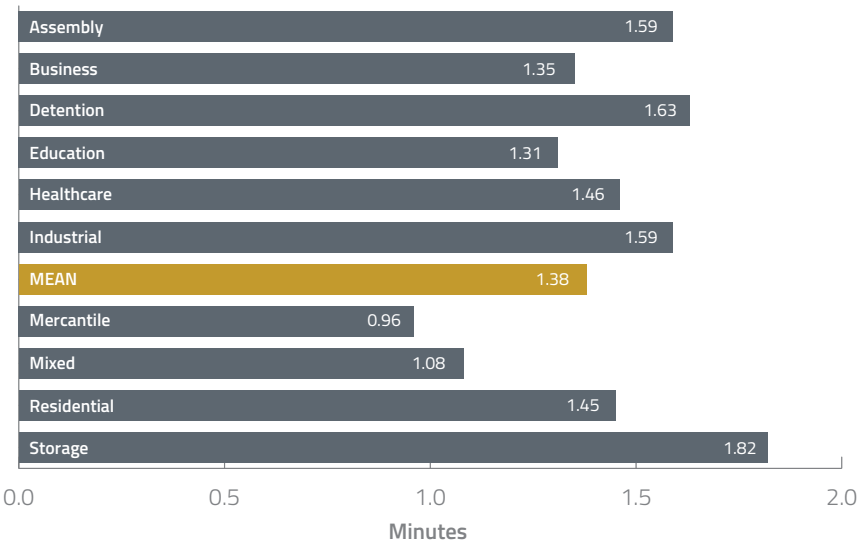
- **Failure Rates:** Detention occupancy types continued to report the highest average failure rate (5.28%), but that rate has decreased by almost one full percentage point from the 2020 average. Mercantile (1.78%) and Healthcare (1.83%) reported the lowest average failure rates, while overall averages rose from a mean of 2.97% through 2019 to 3.02% through 2020. However, Healthcare (1.93%), Mixed Use (1.92%), and Mercantile (1.89%) all reported failure rates below 2%.

- **Time & Quantity:** Of all the device categories, SuppressionScan reported the lowest average total inspection time at 29.14 minutes, aided by the large volume of kitchen hood suppression devices in contrast to the larger industrial system types. The effect of this contrast was further evidenced by the average Industrial average of 45.57 minutes versus the 8.88-minute average for Mercantile, and average device counts of 28.63 and 9.21, respectively.

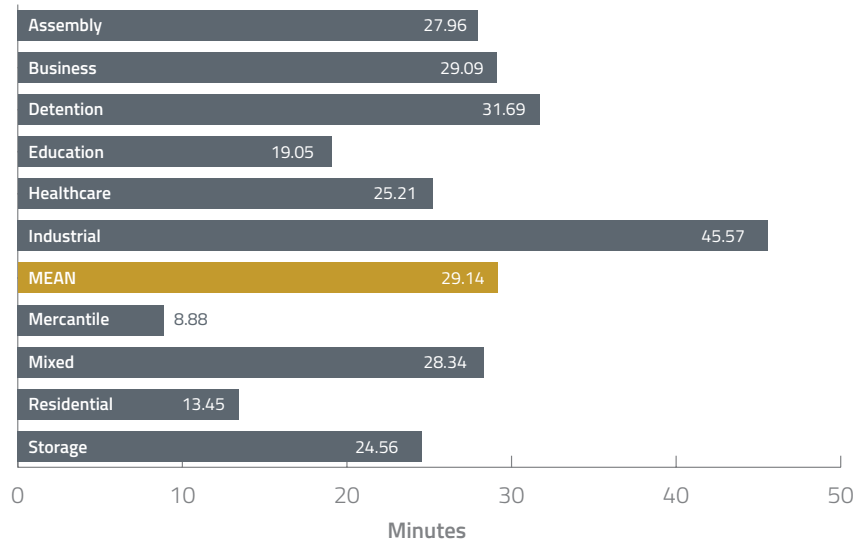
SuppressionScan Average Number of Devices per Inspection by Occupancy Type



SuppressionScan Average Device Inspection Time by Occupancy Type



SuppressionScan Average Total Inspection Time by Occupancy Type



What Devices Fail and Why

In this section, we have compiled granular device-level data collected using the five BuildingReports' ScanSeries® applications to examine why various device types failed inspection.

Before reviewing the data, consider the following key factors:

- As mentioned previously, SprinklerScan data does not include all sprinkler heads within a facility due to the data collection method not requiring each individual head to be barcoded and scanned on inspection.
- Devices without a sufficient sample size were excluded from the device-level analysis.
- The failure reasons have been organized into the groupings below, including some verbatim examples that are included in the raw data used for analysis. Please note that these small samples are taken directly from the data as entered by users:

Damaged

Examples: Damaged/Worn, Leaking, Rusted, Painted, Broken, Speaker Blown, Caked, Excessive Dent, Cylinder Damaged, Discharged, Corrosion

Defective

Examples: Defective, Failed Test, Failed Sensitivity, Failed Operation, Impairment, Improper Operation, Inadequate Coverage, Unlocked/Unsealed, Circuit Failure, Coupling Failure, Dirty/Contaminated

Device or Component Missing

Examples: Device Missing, Cap Missing, Valve Missing, No Signage Missing Parts, No Device Installed, Out for Repair, Removed for Construction, Extinguisher Missing, Label/Tag Missing

Disconnected

Examples: Disconnected, No Power Supply, No Water Supply, Unit Unplugged, Not Wired Correctly, Device Not Connected, Did Not Report to FACP, No Connection to Air Unit, No Communication

Expired or Decommissioned

Examples: Expired, Date Expired, Device Expired Decommissioned, No Install Date, Visibly Old, Out of Date, Out of Service, Battery Dead/Expired, Tag Expired, Installed in 1993, Nozzle Expired, Obsolete, Replace, Service Life Over

Inaccessible or Blocked

Examples: Door Locked, Room Occupied, Access Denied, Inaccessible, Cannot Inspect, Can't Reach to Test, No Access, Area Under Construction, Obstructed

Incompatible

Examples: Incompatible, Incorrect Size, Unauthorized Field Mod, Wrong Head, Wrong Valve, Wrong Hose, Improper Device

Incorrect Description

Examples: Bad Description, Wrong Description, Description Change, Incorrect Description, Incorrect Reporting, Incorrect Text Label, Message Change, Misleading FACU Description, No Address on Device, No Description, Programming Error, Reports as Supervisory

Location Discrepancy

Examples: Could Not Locate, Change Location, Did Not Locate, Location Unknown, Needs Relocating, Too Close to Ceiling Fan, Too Close to Vent, Wrong Location

Not Specified

Example: (blank/no data)

Other

Examples: Special Note, See Notes, Customer Request

Requires Maintenance

Examples: Requires Maintenance, Needs Remounting, Needs Hydrostatic Testing/Hydro Due, Needs Cleaning, Needs Adjustment, Needs Remounting, Reprogram/Needs Programming, Needs Charging, Needs 6yr Maintenance, Breakdown Due, Improperly Mounted, 5 Year Internal Due, Exercise, Replace Gauge, Untighten Coupling

These categories reflect a few changes from previous editions of this report. Asbestos Abatement was removed as a separate data point in the 2020 edition of the report for FireScan due to falling below the 0.01% threshold. Also, Other/Not Specified is now reported as a separate category so that devices with no data are reported separately rather than as a combined statistic.

In the 2020 calendar year, we began to see more devices fall into the Inaccessible or Obstructed category due to the pandemic. The failure reasons included verbatim responses such as "Quarantine Area" or "COVID-19," responses that represent the challenges of performing inspections over the course of the year. For 2021, there was not a noticeable shift in this metric, but the following data does indicate a rise in the number of devices failing due to requiring maintenance.

Finally, the effort initiated in 2020 to include more data in the analysis by decreasing the minimum count requirements for inclusion continued with the 2021 report. While this change requires more time and effort to conduct the analysis compared to pre-2020 reports, the analysis now incorporates more low-volume specific verbatim responses due to their specificity (Examples: "11/12/12 access denied" or "Reports as 9th floor stairwell"). The net result is a more accurate reflection of failure reasons (e.g., Incorrect Description and Location Discrepancy) that inherently had more verbatim descriptions with very low counts.

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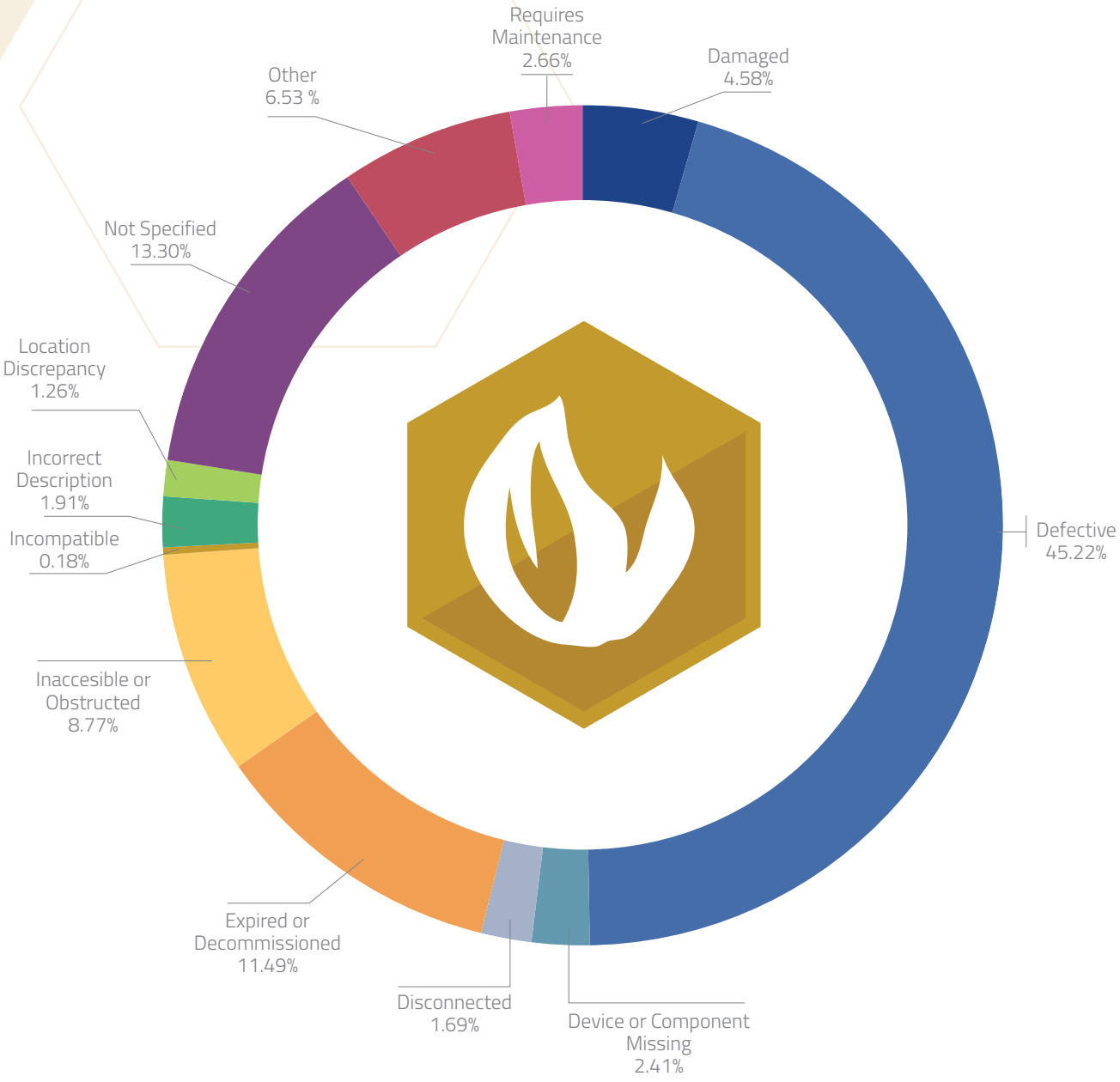
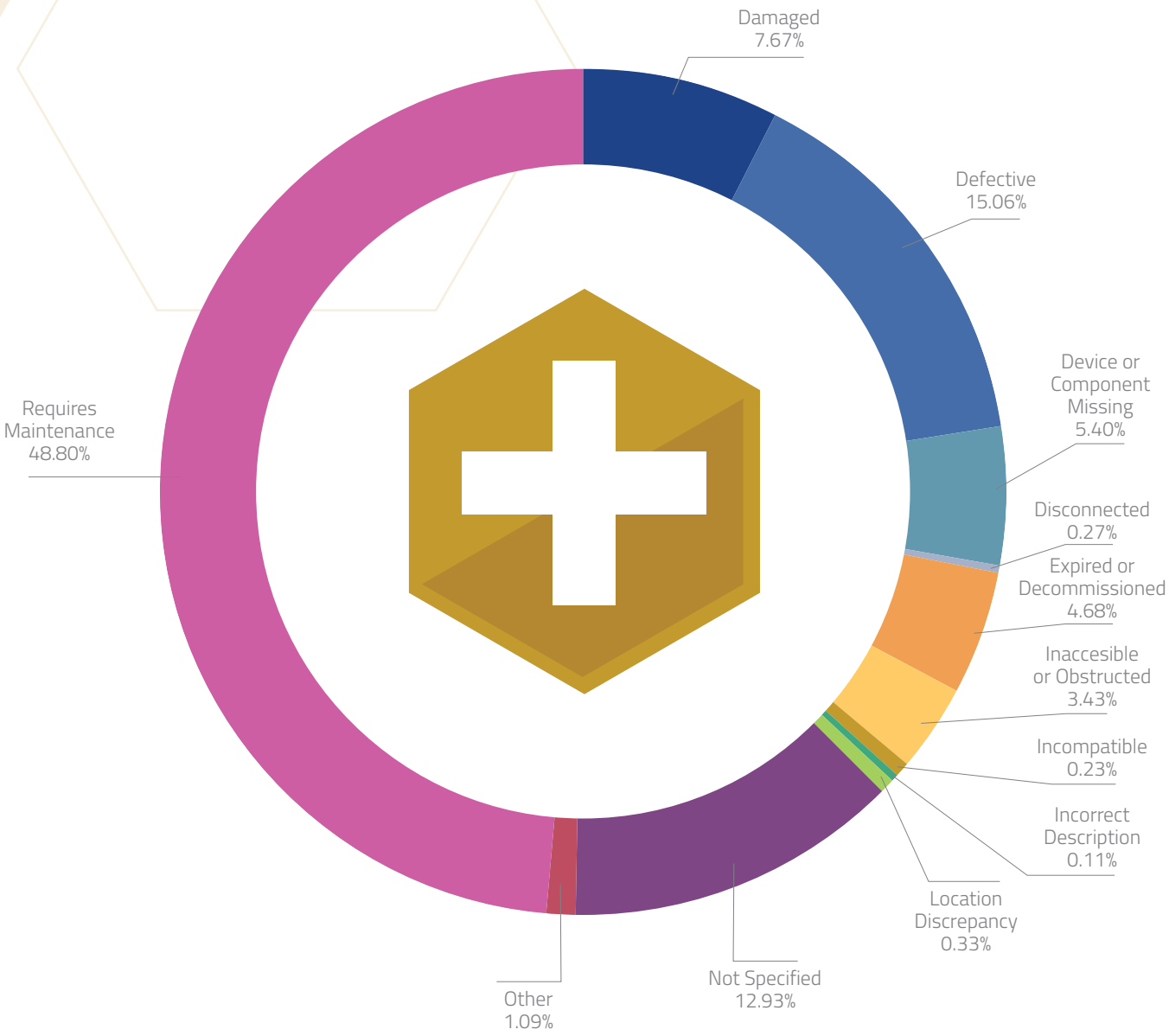
FireScan® Failure Reasons



Takeaways

- Failures related to the **Defective** category continued to account for the largest percentage of FireScan devices at 45.22%, down slightly over 2% versus the 2020 benchmark report.
- **Not Specified** (13.30%) continued to decline year over year as data collection protocols continued to improve. With **Other** and Not Specified being split for the first time in 2020, the data trend is easier to discern regarding improvements in the Not Specified category.
- **Expired and Decommissioned** devices ranked as the third highest failure reason category at 11.49%, with expired batteries continuing to be a significant portion of the devices failed. Decommissioned devices were reported but at a much lower rate than devices past the expiration date.
- **Inaccessible or Obstructed** devices (8.77%) most often failed due to the inspector's inability to gain access for testing. Since 2019, this figure has increased substantially from 2.75% in 2019 to 7.94% in 2020 and to nearly 9% in 2021, underscoring the inspection and compliance challenges experienced over the past 2 years.
- Devices failed (6.53%) under the **Other** category included notes to see more complex descriptions included elsewhere in the report that cannot be analyzed at this scale. The remainder included failure reasons that could not be categorized due to vague references or responses, such as "failed by others."
- Devices in the **Damaged** category (i.e., those that had sustained physical damage to the point of not passing code) were reported as 4.58% of the total failed devices. In almost all cases, it was impossible to determine from the descriptions which devices could be repaired and which would need to be replaced. Unless a specific repair or maintenance was mentioned as being required, relevant devices were categorized here versus the **Requires Maintenance** category.
- **Requires Maintenance** (2.66%) also saw a year-over-year increase of 1.2% versus 2020 (1.41%). One possible theory for the rise is that devices failed in 2021 were not accessible in 2020 due to closures or quarantine restrictions. However, nothing within the data allows for any definitive conclusions, and the variation could be part of the natural cycle of maintenance requirements or other factors.
- Not lagging far behind, devices failing due to a **Missing Device or Component** accounted for nearly 2.41% of all FireScan failures.
- As in previous editions of this report, most devices that fell into the **Incorrect Description** (1.91%) or **Location Discrepancy** (1.26%) categories were programmed or labeled incorrectly, or had been placed in a location or position that was not code compliant. In some cases, the location discrepancy may have referred to the location data input into FireScan during a previous inspection, which is impossible to verify accurately at scale.
- Devices that had been **Disconnected** from the alarm system or a power supply accounted for 1.69% of devices, while only 0.18% of devices were reported to be Incompatible with the system or code requirement.

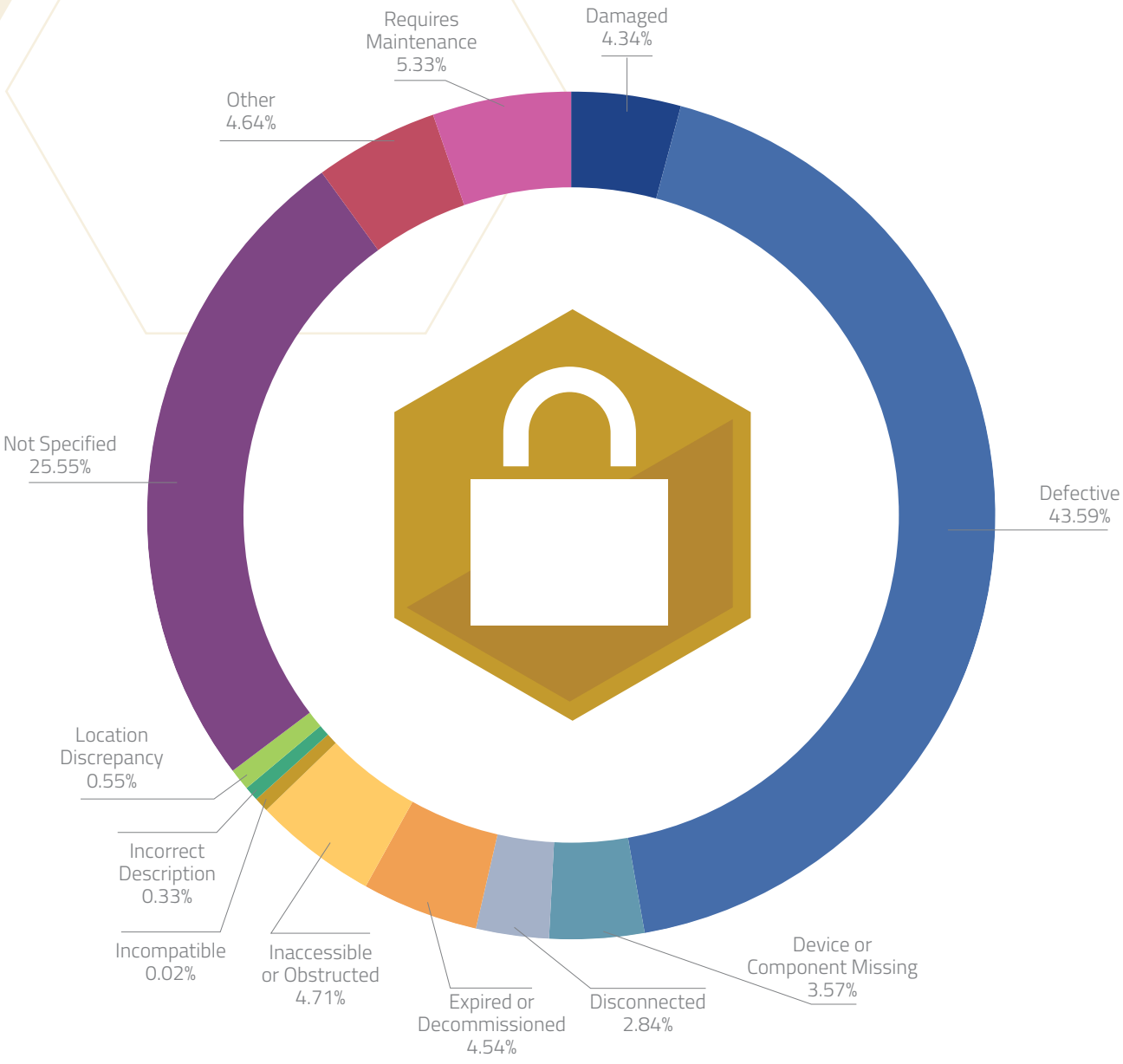
SafetyScan® Failure Reasons



Takeaways

- Devices failing under the **Requires Maintenance** category made up nearly half of all failures for the SafetyScan category at 48.80%. Some of the more frequent responses recorded were devices that were past due for 5-, 6-, and 10-year service requirements by code.
- **Defective** devices continued to represent a higher percentage of failed reasons for the fourth consecutive year at 15.06%, an increase over the 13.76% of devices failed for this reason in the 2021 report.
- **Not Specified**—or devices with no failure reason noted—accounted for 12.93% of all failures. While that percentage does not represent a significant change over previous years, failed devices without any data is notably becoming an increasingly smaller number as time progresses.
- **Damaged** devices were reported at a rate of 7.67% of failures. In reviewing the detailed data, most devices were reported to have rusting or corrosion, with a smaller percentage having sustained physical damage from mistreatment (e.g., dents or broken components).
- **Device or Component Missing** accounted for 4.78% of all failed devices. Bulbs, batteries, fire extinguishers, water stops, covers, bases, and end caps were most frequently noted as not being present at the time of inspection.
- **Expired or Decommissioned** devices comprised 4.68% of failed devices, with most of the failed devices having batteries and extinguishers past their expiration dates. A smaller subset of devices had been Decommissioned for a variety of reasons or were flagged simply as "Decommissioned."
- **Inaccessible and Obstructed** devices were reported as failure reasons for 3.43% of failures for SafetyScan through from 2020 through 2021. Technicians cited verbatim responses that included a lift or ladder being needed to access the device for testing, while others were not accessible due to a locked door or technicians not being given access to an area within the facility. Devices reported as Obstructed made up a smaller share of the reported failures.
- **Other** was the only other failure reason reported above the 1% mark at 1.09%. The remaining reasons accounted for 0.94% of failures combined:
    - **Location Discrepancy** = 0.33%
    - **Disconnected** = 0.27%
    - **Incompatible** = 0.23%
    - **Incorrect Description** = 0.11%

SecurityScan® Failure Reasons

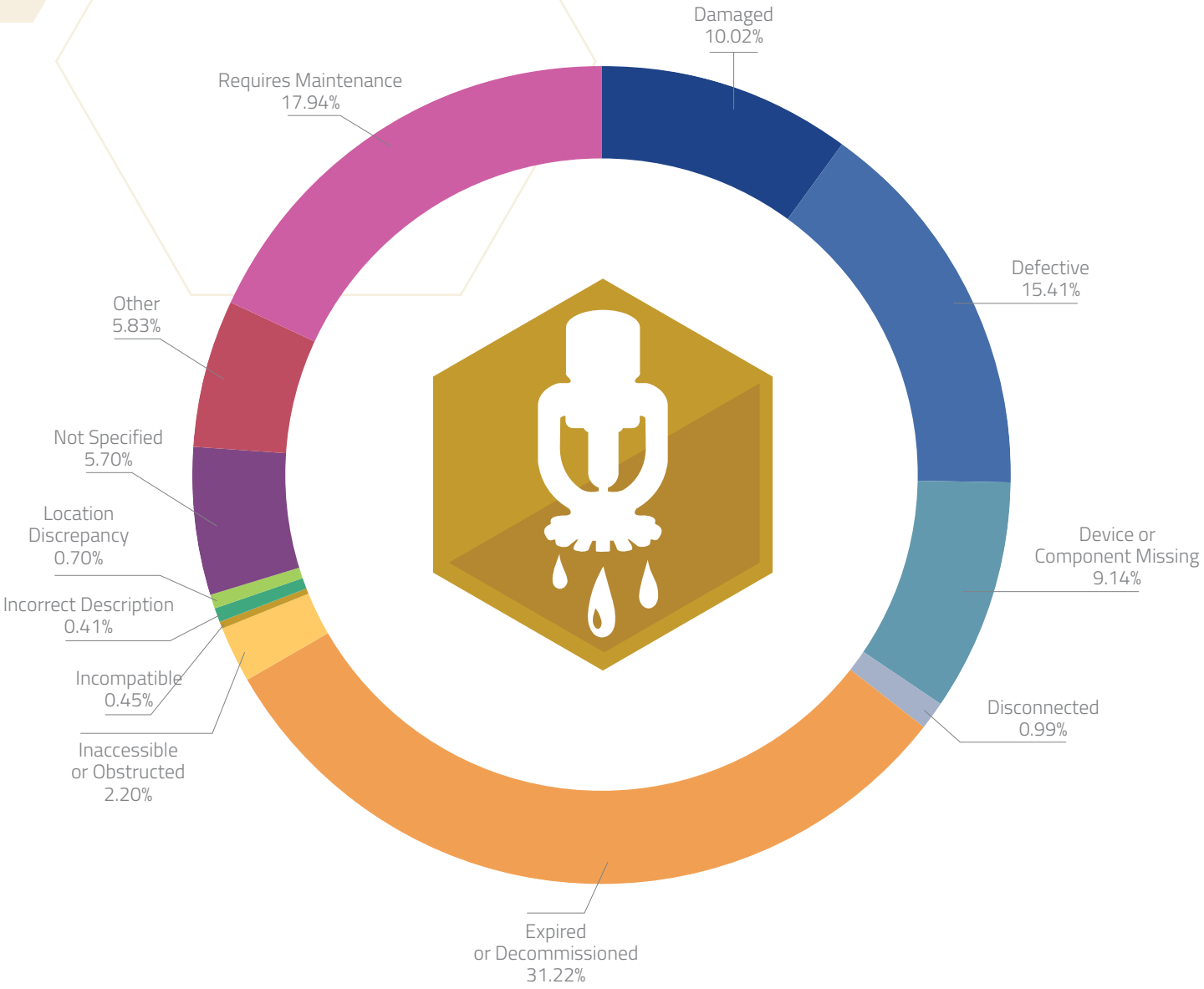


Takeaways

IMPORTANT NOTE: Over the past 2 years, SecurityScan has seen many new device types being added due to being specifically requested by users in the financial services sector. This change becomes more evident in section VI, which is related to the top and bottom device rankings for failure rates in SecurityScan for the 2021 calendar year, but the short-term influences of those additions may have also caused some subtle shifts in the aggregate 2000–2021 device failure reasons versus historical reports.

- **Defective** devices continued to be reported as the highest failure reason in the SecurityScan category at 43.59%. **Failed Operation**, **Failed Test**, or **Failed to Report**, or devices simply flagged as Defective, topped the category, indicating the devices did not meet the preventative maintenance requirements to continue operation without intervention or replacement.
- Compared to the prior two device categories, SecurityScan device failures with no failure reason data reported a much higher failure rate at 25.55%. This rate is still an improvement over previous years with a decline of more than 2%, indicating best practices in data collection continue to improve over time. The primary difference between SecurityScan and the previous two categories is that usage for this device category often involves preventive maintenance versus mandated code compliance.
- **Requires Maintenance**, the only other failure reason over the 5% mark at 5.33%, continued to rank third. Many of the failure reasons cited issues with camera position, video quality, programming issues, and other adjustments required over time as systems age. Cleaning and replacement parts were also common issues related to environmental factors (e.g., weather, animals, and people).
- **Inaccessible or Obstructed** devices were reported as the cause for 4.71% of failures, with the majority once again containing "Inaccessible" or "Denied Access" in the verbatim responses.
- Devices in the **Expired or Decommissioned** category failures were reported at a rate of 4.54%, most with references related to the device being past the expiration date. A relatively small subset was reported as "Decommissioned."
- The **Device or Component Missing** category rose from 2.23% of devices failed in 2020 to 3.57% in 2021. While the percentages are relatively small in comparison to the overall sample size, the percentage change represents a relatively large increase at 1.34%. What may have driven the change in a relatively short period of time remains unclear.
- Devices that had been **Disconnected** remained relatively consistent at a 2.94% failure rate. Wiring issues or the device being disconnected from a power source were the most frequent culprits.
- The following failure reasons were of least concern with very few failures reported compared to many others for the category:
  - **Location Discrepancy** = 0.55%
  - **Incorrect Description** = 0.33%
  - **Incompatible** = 0.02%

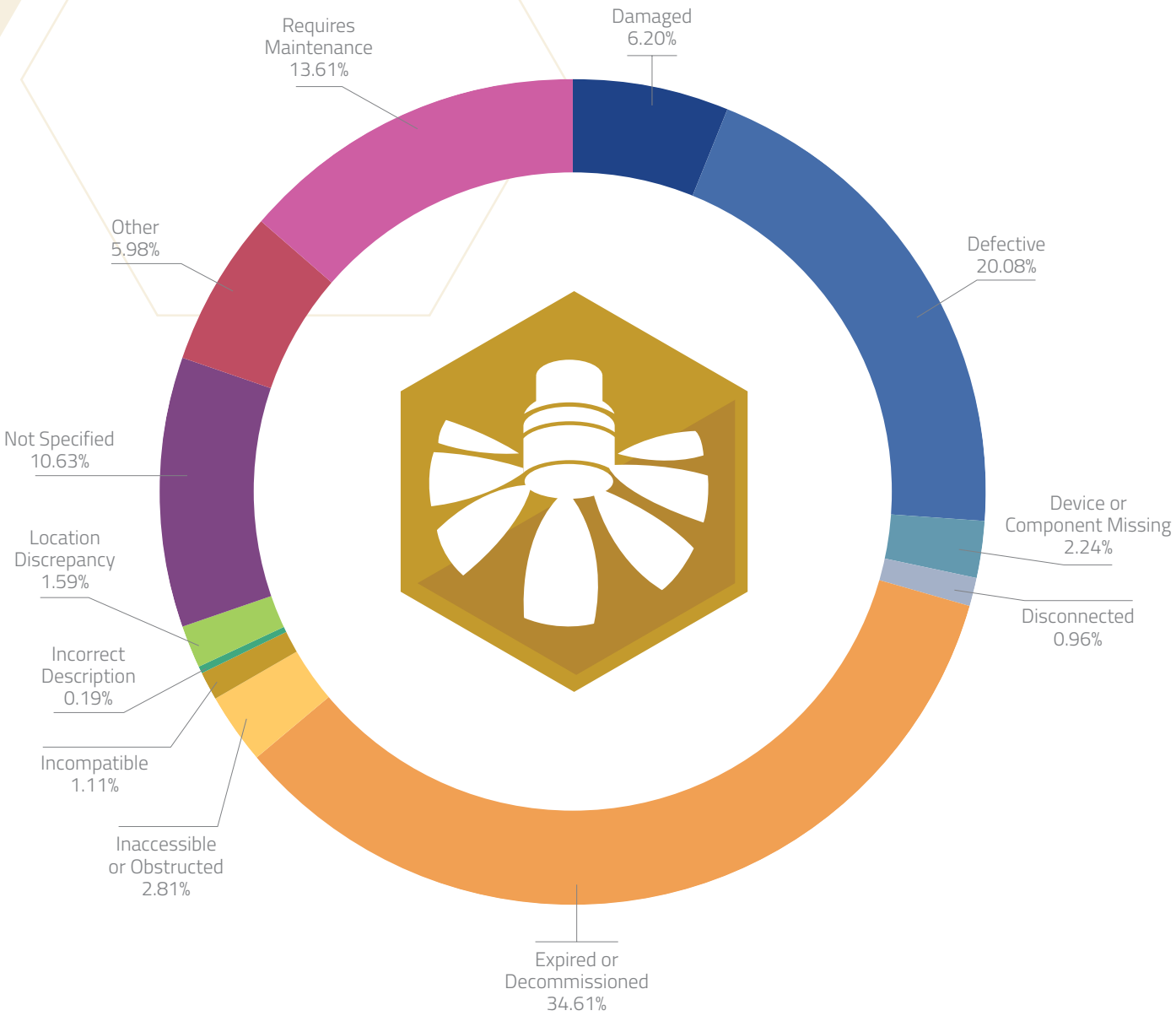
SprinklerScan® Failure Reasons



Takeaways

- **Expired or Decommissioned** devices were reported 31.22% of the time as the failure reason. While most of those failures were related primarily to expiration dates like in other categories, Decommissioned devices were noted more frequently regarding fire sprinkler systems than in other ScanSeries applications.
- **Defective** devices ranked as the second highest failure reason at 15.41% of all failures. Both Defective (-2.57%) and Expired or Decommissioned (-2.90%) failure reasons reported a decrease versus the prior year, resulting in higher percentages for other failure reasons, most notably **Requires Maintenance**.
- **Requires Maintenance** failures grew at a higher-than-normal pace through the 2021 data, becoming the second highest failure rate for the category at 17.94%. This rate represents a 5.33% increase from the 12.69% of devices failed through the 2020 calendar year. The growth occurred primarily due to sprinkler systems being overdue for periodic mandated testing every 5 or 10 years. Given the scale of the short-term shift, it can be reasonably be assumed that the backlog of required testing did not occur during the prior year due to the number of facilities closed and/or unavailable for inspection during the period from 2020 through 2021.
- In contrast, **Damaged** devices decreased by a marginal sum, from 10.08% to 10.02%. As in previous reports, **Painted**, **Corroded**, and **Rusted** device responses were the damages most cited by inspectors, with the Residential and Detention occupancy types citing the highest rates for the category, as illustrated previously.
- **Device or Component Missing** accounted for 9.14% of failures, with missing code-required signage as the most prevalent challenge facing facilities. Since the introduction of this report in 2015, which covered data through the 2014 calendar year, signage continues to be an ongoing issue for some facilities.
- As mentioned previously in this report and its predecessors, **Other and Not Specified** had been previously reported together in the failure reasons section. However, unlike other device categories, SprinklerScan shows a roughly even distribution of device failures between the two failure reasons. **Other** (5.83%), or devices with special notes or complex descriptions not easily categorized, and **Not Specified** (5.70%), or devices with no data recorded when failed during an inspection, reported very similar failure rates.
- **Inaccessible or Obstructed** were reported to account for 2.20% of total sprinkler device failures. In some of the device types covered in this report, there was a relatively large gap between the two failure reasons. However, physical obstruction of the device was reported at a relatively higher frequency for sprinkler systems. In some cases, sprinkler heads were even obstructed by drop ceilings or other structures preventing the proper function of the sprinklers.
- All remaining failure reason categories were below the 1% mark, as shown below:
  - **Location Discrepancy** = 0.70%
  - **Incompatible** = 0.45%
  - **Incorrect Description** = 0.41%

SuppressionScan® Failure Reasons



Takeaways

- **Expired or Decommissioned** device failures led the categories for fire suppression systems at 34.61%. In fact, nearly one-third of failures included the verbatim failure reason of "Date Expired" in addition to other related responses.
- **Devices failed due to being Defective** ranked second highest at 20.08%, in a similar pattern to SafetyScan device failures. Both top-ranked failure reasons appear to be in largely due to the similarity between fire extinguishers and agent-based fire suppression systems. Combined with **Expired and Decommissioned** failures, the two failure categories comprise more than half (54.85%) of all device failures in the database. However, the combined total for SafetyScan devices accounted for 63.86% of all failures, almost 10 percentage points higher than for SuppressionScan.
- **Requires Maintenance** failures ranked third for the device category at 13.61%. Most of these device failures were due to services not performed as required by code mandated at various intervals (5-, 6-, 10- and 12-year maintenance). While not as significant of an increase as noted for SprinklerScan devices, the increase for SuppressionScan devices may also be attributed to suppression systems that did not receive regularly scheduled maintenance over the past 2 years due to facility closures. Note that, in the SuppressionScan detail in section VI, the highest average failure rates occurred in **Detention** (5.28%), **Residential** (4.68%), **Educational** (4.16%), and **Assembly** (3.34%) occupancy types, all of which were impacted heavily during the period.
- **Not Specified**, or devices with no failure reason given, accounted for 10.63% of all device category failures. We do not see a steady decrease at the same rate as other applications, but the slight decrease (-0.03%) is an improvement.
- **Damaged device** failures were reported as 6.20% of the total. Similar verbatim responses ("Corroded," "Broken," "Clogged," etc.) were included for SuppressionScan devices as in other device categories.
- **Inaccessible or Obstructed** devices were reported as 2.81% of all failures, a slight increase from 2.55% in 2020. Most Inaccessible devices were due to the inspector being denied or unable to gain entry; however, a significant portion of suppression devices were physically obstructed and would not perform as intended in the event of a fire.
- **Device or Component Missing** failures included numerous components, from nozzles and heads to detectors and signage. The largest percentage continued to be the general note "Missing Parts," without a specific reference to the part in question, which was likely included in the long form Notes field that is not part of this analysis but is available within the report detail for members and facilities seeking more detailed information.
- **Location Discrepancy** was cited as the failure reason for 1.59% of failed devices. While some of these devices were not in the location indicated in previous reports, the majority were suppression systems that had coverage issues because of the system not being installed properly based on the current location of the potential fire hazard it was installed to protect.
- **Disconnected** devices were reported at a rate of 0.96%, while **Incorrect Description** was only cited 0.19% as the issue for failed devices.

Individual Device Performance

The following section contains the top-10 lists for both the highest and lowest individual device rankings in terms of failure rate and average device inspection time. With the 2020 edition of the report, the decision was made to solely focus on the prior year's individual device statistics to better reflect current trends given the volume of data available since 2000. In prior editions, including all of the data since 2000 resulted in outdated technology making its way into the rankings, such as VCRs that have been mostly replaced with DVRs. As mentioned previously, BuildingReports is continuously adding new devices to the database – at the request of customers, as the industry evolves, and as a result of new industries becoming more significant users of or solutions (i.e., maritime vessels).

FireScan Failure Rate Highs and Lows

Device Type	Lowest Failure Rate by Device Type
Fan Running	0.32%
Fire Pump Auto	0.40%
Pre-Action System	0.43%
Transformer	0.49%
Multi-Sensor Detector	0.57%
Gas Shutdown	0.58%
Generator Auto	0.71%
Damper	0.78%
Fire Pump Trouble	0.93%
Expander Panel	0.98%

Device Type	Highest Failure Rate by Device Type
Roll Down Door	27.02%
Speaker Array	25.06%
Emergency Light	18.81%
Flame Detector	14.19%
Fan Purge System	13.85%
Amplifier	13.63%
Signage	11.88%
Battery	11.60%
No Entry Sign	10.10%
Generator Running	10.06%

FireScan Inspection Time Highs and Lows

Device Type	Lowest Average Inspection Time per Device (Minutes)
Fan Running	0.82
Speaker	0.97
Speaker/Strobe	0.98
Horn	1.02
Horn/Strobe	1.05
Damper	1.06
Generator Auto	1.11
Strobe	1.11
CO Alarm	1.12
Indicating Device	1.13

Device Type	Highest Average Inspection Time per Device (Minutes)
Microphone	10.17
Low Temperature	4.13
Transformer	4.09
Amplifier	3.83
Sliding Door	3.74
Aspirating Detector	3.66
Chemical System	3.59
Pre-Action System	3.58
System Documents	3.35
Disconnect	3.32

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SafetyScan Failure Rate Highs and Lows

Device Type	Lowest Failure Rate by Device Type
Eye Protection	0.30%
Personal	0.48%
Breathing Air Compressor	0.60%
Non-Rated Door	0.62%
Breathing Apparatus	0.98%
Transfer Switch	1.13%
Signage	1.15%
Disinfected Surface	1.32%
Special System	1.38%
Fire Blanket	1.41%

Device Type	Highest Failure Rate by Device Type
Firestopping	30.78%
Fire Hose	28.36%
Cabinet	28.18%
Range Hood	26.83%
Toggle Switch	24.71%
Fire Barrier	22.83%
Storage Container	22.26%
Evacuation Chair	20.37%
Egress Markers	20.21%
Regulator	18.10%

SafetyScan Inspection Time Highs and Lows

Device Type	Lowest Average Inspection Time per Device (Minutes)
Signage	0.57
Emergency Generator	0.87
Scaffolding	0.88
Reducer	0.89
Tools	1.11
Lockout	1.14
Actuator	1.17
Exit Sign	1.22
Respirator	1.29
Gas Mixture	1.32

Device Type	Highest Average Inspection Time per Device (Minutes)
Fire Smoke Damper	7.09
Clothing	5.91
Range Hood	5.54
Toggle Switch	5.24
Fire Damper	4.79
Cabinet	4.57
Hearing Protection	4.51
Shower Station	3.95
Breathing Apparatus	3.56
Ladder	3.39

SecurityScan Failure Rate Highs and Lows

Device Type	Lowest Failure Rate by Device Type
2-Jack Station*	0.00%
Audio System*	0.00%
Client Station*	0.00%
Drive-Up Lane*	0.00%
Entrance*	0.00%
Fence*	0.00%
Multiplexer*	0.00%
Parking*	0.00%
Programmable Module*	0.00%
Room Monitor*	0.00%
Safe Deposit Box*	0.00%
Standalone Lockset*	0.00%
Teller Counter Pedestal*	0.00%
Video Encoder*	0.00%
Video Surveillance System*	0.00%
Virtual Wall Monitor*	0.00%
Wireless Mesh Network Radio*	0.00%
Burglar Alarm System	0.08%
Safe	0.09%
2-Button Station	0.10%

**As mentioned previously, the addition of many new devices specific to financial services facilities in recent years resulted in numerous devices with a failure rate below 0.01%. As a result, the top 20 are included for greater perspective.*

SecurityScan Failure Rate Highs and Lows

Device Type	Highest Failure Rate by Device Type
Battery	31.02%
Exit	25.80%
Wireless Lock	22.76%
Telephone	14.49%
Storage	14.46%
Emergency Call Box	14.17%
Access Sensor	13.73%
Detector	11.87%
Visual	11.73%
Electric Strike	11.50%
Turnstile	10.42%
Video Decoder	10.00%
Batteries	9.93%
Code Blue	9.66%
Radio	9.52%
Transmitter	9.10%
Keypad	8.42%
Sensor	6.67%
PTZ Unit	6.16%
Switch	5.46%

SecurityScan Inspection Time Highs and Lows

Device Type	Lowest Average Inspection Time per Device (Minutes)
Remote Audio Station	0.39
Remote DIN Station	0.50
2-Jack Station	0.51
Bed Exit	0.66
Exciter	0.70
Transmitter	0.71
Teller Counter Pedestal	0.76
Client Station	0.80
Patient Monitor	0.92
Bath Station	0.94
Shower Station	0.97
Vehicle Sensor	1.03
Video Surveillance System	1.05
Programmable Module	1.07
Request to Exit	1.07
Bedside Station	1.10
Monitoring	1.12
Dome Light	1.13
Audible	1.16
Feature Bed	1.17

SecurityScan Inspection Time Highs and Lows

Device Type	Highest Average Inspection Time per Device (Minutes)
Safe Deposit Box	15.33
Video Console	9.33
Entrance	8.89
Air Monitor	8.16
Monitor	5.36
Surge Protector	5.30
Fence	5.19
Computer	5.17
Virtual Wall Monitor	4.79
Wireless Mesh Network Radio	4.70
Emergency Call Box	4.24
Barrier	4.01
Exit Device	3.89
Switch	3.57
Main Controller	3.55
NVR	3.45
Parking	3.37
Defibrillator	3.35
Interface	3.27
PTZ Unit	3.24

SprinklerScan Failure Rate Highs and Lows

Device Type	Lowest Failure Rate by Device Type
Pump Test	0.05%
Emergency Release	0.56%
Hose Nozzle	0.64%
Fire Pump Trouble	0.67%
Temperature Alarm	0.81%
Fire Pump Phase Reversal	0.94%
Jockey Pump	1.33%
Fire Pump Off	1.36%
Heating System	1.39%
Drain	1.49%

Device Type	Highest Failure Rate by Device Type
Manual Desiccant	28.46%
Valve Enclosure	24.05%
Foam Tank	19.85%
Piping	17.18%
Dry Pipe Valve	16.32%
Antifreeze System	14.73%
Pressure Relief	13.85%
Siren	13.57%
Standpipe	12.71%
Fuel Storage Tank	12.48%

SprinklerScan Inspection Time Highs and Lows

Device Type	Lowest Average Inspection Time per Device (Minutes)
Fire Pump Off	0.76
Fire Pump Running	0.82
Fire Pump Trouble	0.82
Fire Pump Gauge	0.87
Fire Pump Phase Reversal	0.87
Fire Pump Power	0.88
Gauge	0.96
Alarm Valve	0.96
Pressure Regulating	0.96
Tamper Switch	0.99

Device Type	Highest Average Inspection Time per Device (Minutes)
Valve Enclosure	6.61
Pressure Relief	5.85
Fire Hydrant	5.02
Monitor Nozzle	4.29
Backflow Prevention	3.96
Test Header	3.66
Pump Test	3.56
Hose Nozzle	3.49
Casing Relief Valve	3.30
Alternate Power	3.17

SuppressionScan Failure Rate Highs and Lows

Device Type	Lowest Failure Rate by Device Type
Lockout	0.19%
Air Compressor	0.27%
Detector	0.34%
Waterflow Switch	0.45%
Abort Station	0.49%
Speaker/Strobe	0.58%
Tamper Switch	0.60%
Smoke Detector	0.72%
Bell	0.75%
Pressure Switch	0.78%

Device Type	Highest Failure Rate by Device Type
Fire Barrier	27.31%
Hose	26.77%
Beam Detector	24.26%
Pneumatic Siren	21.50%
As-Builts	17.72%
Siren	17.68%
Wheeled Unit	15.20%
Control Valve	15.09%
Halon System	15.04%
Pneumatic Time Delay	14.48%

SuppressionScan Inspection Time Highs and Lows

Device Type	Lowest Average Inspection Time per Device (Minutes)
Emergency Light	0.44
Pressure Detector	0.54
Chime	0.62
Fan Shutdown	0.66
Spark Detector	0.68
Duct Detector	0.70
Dump Switch	0.70
Emergency Power Off	0.72
Gauge	0.81
Pre-Action Valve	0.81

Device Type	Highest Average Inspection Time per Device (Minutes)
Pneumatic Siren	4.86
Logbook	4.48
Pneumatic Time Delay	3.87
Wheeled Unit	3.84
Foam Tank	3.61
Aspirating Detector	3.19
Fire Barrier	3.01
Pre-Action System	2.77
Beacon	2.56
Control Panel	2.45

Appendix A

Inspection App	Occupancy Type	Avg. Total Inspection Time	Avg. Inspection Time/Device	Avg. Devices /Building	Avg. Failure Rate
FireScan	Assembly	185.17	1.94	95.26	2.81%
FireScan	Business	135.98	1.87	72.71	2.75%
FireScan	Detention	155.89	1.73	90.14	2.18%
FireScan	Educational	155.52	1.69	92.14	2.15%
FireScan	Healthcare	303.18	1.70	178.53	1.17%
FireScan	Industrial	99.62	2.07	48.13	3.28%
FireScan	Mercantile	117.23	1.96	59.71	3.90%
FireScan	Mixed	151.59	1.84	82.42	1.94%
FireScan	Residential	130.19	1.51	86.11	2.77%
FireScan	Storage	70.30	2.05	34.29	3.25%
SafetyScan	Assembly	79.79	2.16	36.96	8.59%
SafetyScan	Business	71.35	2.26	31.54	8.27%
SafetyScan	Detention	79.95	2.99	26.78	8.53%
SafetyScan	Educational	68.19	2.03	33.58	8.69%
SafetyScan	Healthcare	84.83	1.72	49.19	3.40%
SafetyScan	Industrial	129.89	1.98	65.70	8.01%
SafetyScan	Mercantile	57.44	2.09	27.53	11.12%
SafetyScan	Mixed	57.37	1.92	29.91	5.45%
SafetyScan	Residential	90.52	2.35	38.55	10.99%
SafetyScan	Storage	55.17	1.72	32.01	5.77%
SecurityScan	Assembly	282.55	4.10	68.96	5.24%
SecurityScan	Business	62.77	1.90	33.09	2.44%
SecurityScan	Detention	177.41	1.47	120.32	1.64%
SecurityScan	Educational	84.70	2.22	38.20	5.01%
SecurityScan	Healthcare	126.17	1.23	102.56	2.32%
SecurityScan	Industrial	94.84	2.12	44.74	2.51%
SecurityScan	Mercantile	78.01	2.61	29.93	2.50%

Inspection App	Occupancy Type	Avg. Total Inspection Time	Avg. Inspection Time/Device	Avg. Devices /Building	Avg. Failure Rate
SecurityScan	Mixed	69.35	2.89	24.00	2.65%
SecurityScan	Residential	66.40	1.50	44.34	2.58%
SecurityScan	Storage	37.16	1.83	20.28	2.05%
SprinklerScan	Assembly	56.12	1.76	31.81	5.69%
SprinklerScan	Business	47.80	1.67	28.62	5.63%
SprinklerScan	Detention	59.14	1.58	37.44	6.34%
SprinklerScan	Educational	38.70	1.49	25.96	5.88%
SprinklerScan	Healthcare	61.69	1.63	37.87	2.14%
SprinklerScan	Industrial	60.80	1.60	38.09	4.31%
SprinklerScan	Mercantile	37.51	1.54	24.31	4.59%
SprinklerScan	Mixed	56.04	1.55	36.04	5.18%
SprinklerScan	Residential	66.40	1.48	44.96	6.41%
SprinklerScan	Storage	64.30	1.71	37.69	5.13%
SuppressionScan	Assembly	27.96	1.59	17.61	3.34%
SuppressionScan	Business	29.09	1.35	21.62	3.12%
SuppressionScan	Detention	31.69	1.63	19.38	5.28%
SuppressionScan	Educational	19.05	1.31	14.58	4.16%
SuppressionScan	Healthcare	25.21	1.46	17.30	1.93%
SuppressionScan	Industrial	45.57	1.59	28.63	3.23%
SuppressionScan	Mercantile	8.88	0.96	9.21	1.89%
SuppressionScan	Mixed	28.34	1.08	26.28	1.92%
SuppressionScan	Residential	13.45	1.45	9.28	4.68%
SuppressionScan	Storage	24.56	1.82	13.47	3.11%

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Building safety compliance is critical to service companies, building owners, and fire and safety officials who are charged with safeguarding occupants. BuildingReports' award-winning mobile and online inspection reporting tools enable inspectors to gather data on fire and life safety devices quickly to ensure that they are working properly and meet code requirements or to identify actions needed to meet compliance through easily verifiable inspection reports. With millions of inspection reports to date, hundreds of thousands of buildings represented and over 1,000 inspection companies in its network, BuildingReports has earned its reputation as the trusted name in compliance reporting. **For more information, contact sales@buildingreports.com or visit www.buildingreports.com**.

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