Webinar Training

2021 Model Codes
Summary of Key Changes

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Course Description

An informative discussion that provides a sneak preview of the new requirements in the soon to be published International Code Council (ICC) and National Fire Protection Association (NFPA) for in-building emergency responder radio enhancements systems, low frequency audible fire alarm signal, visible notification appliances, emergency voice alarm communication (EVAC) systems, carbon monoxide (CO)/smoke detection systems and pull stations.

Learning Objectives

1. Provide an overview of some of the key changes to the 2021 Model Codes
2. Cover the information as to why the new requirements were needed
3. Explain how the new requirements will enhance public life safety
4. Review how the new changes will impact the system, installation or maintenance of the various life safety systems

AIA Continuing Education Provider

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Welcome our Presenter – Richard Roberts

Richard Roberts

- Industry Affairs Manager, Honeywell Fire Safety
- The Board of Directors for the Center for Campus Fire Safety (CCFS)
- Chair CCFS Codes, Standards & Technical Research Committee
- Member of fifteen NFPA Technical Committees
- Two Underwriters Laboratories (UL) Standards Technical Panels
- Participates in numerous International Code Council (ICC) Fire Code Action Committee (FCAC) Working Groups
- Chair of the National Electrical Manufacturers Association (NEMA) Building Codes Committee
- Over 35 years in the fire alarm and security markets

AGENDA

Summary of Changes to 2021 ICC Codes:

- International Fire Code (IFC)
- International Building Code (IBC)
- International Existing Building Code (IEBC)

Summary of Changes to 2021 NFPA Codes:

- NFPA 101, *Life Safety Code*
- NFPA 1*, Fire Code*

INTRODUCTION

Comments and opinions during the presentation are exclusively the presenter and do not reflect an official position of the International Code Council (ICC), National Fire Protection Association (NFPA), its employees, or any of the Technical Committees

This presentation will not cover all the revisions, editorial changes, details, requirements or exceptions

Highly recommend purchasing a copy of the ICC or NFPA Code or the Handbook for all the changes, requirements and details:

www.nfpa.org

www.iccsafe.org

INTRODUCTION

All changes in presentation will be referenced using legislative text

~~Red strike through~~ means text is being removed

Blue underline means text is being added

Black text means no changes

2021 I-CODE CHANGES

2021 IFC

Emergency Responder Radio Coverage

SECTION 202 DEFINITIONS

RF RADIO FREQUENCY (RF). A measurement representing the oscillation rate of electromagnetic radiation spectrum, or electromagnetic radio waves, from Public Safety frequency bands as specified by the fire code official.

CRITICAL AREAS. Areas that are designated for emergency responder radio coverage including exit stairs, exit passageways, elevator lobbies, fire protection equipment room and control valve locations, fire command centers and other areas identified by the fire code official.

2021 IFC

Emergency Responder Radio Coverage

SECTION 202 DEFINITIONS, continued

ACTIVE RF EMITTING DEVICE. Any type of circuit component that requires an AC or DC power source with the ability to electrically control electron flow and/or amplification of RF signal, including but not limited to signal boosters, repeaters, Bi-directional amplifiers, Fiber Distributed Antenna Systems.

PASSIVE RF EMITTING DEVICE. A device that does not require an external AC or DC source of power for its operation, and does not provide amplification of the RF signal including but not limited to coax, couplers, splitters and passive antennas.

2021 IFC

Emergency Responder Radio Coverage

SECTION 202 DEFINITIONS, continued

DELIVERED AUDIO QUALITY (DAQ). A measure of audio quality over a transmission medium. This metric is often used to quantify the quality of audio heard over a radio system. DAQ levels are defined by the following scale: DAQ 1 = Unusable. Speech is present but not understandable. DAQ 2 = Speech is understandable with considerable effort. Requires frequent repartition due to noise or distortion. DAQ 3 = Speech understandable with slight effort. Requires occasional repetition due to noise or distortion. DAQ 3.4 = Speech understandable without repetition. Some noise or distortion present. DAQ 4 = Speech easily understandable. Little noise or distortion. DAQ 5 = Perfect. No distortion or noise discernible.

2021 IFC

Emergency ~~Responder~~ ~~Radio~~ Communication Coverage

510.1 510.1 Emergency ~~responder radio~~ communication coverage in new buildings. ~~New buildings shall have *approved* radio~~ Emergency communication coverage for emergency responders shall be provided in all new buildings. Emergency communication coverage within the building shall be based on the existing coverage levels of the public safety communication systems utilized by the jurisdiction, measured at the exterior of the building. This section shall not require improvement of the existing public safety communication systems.

510.2 Emergency ~~responder radio~~ communication coverage in existing buildings. Existing buildings shall be provided with *approved* ~~*radio*~~ emergency communication coverage for emergency responders as required in Chapter 11.

510.3 Permit required. A construction permit for the installation of or modification to emergency ~~responder radio~~ communication coverage systems and related equipment is required as specified in Section 105.7.6. Maintenance performed in accordance with this code is not considered a modification and does not require a permit.

2021 IFC

Emergency Communications Coverage

510.4 Technical requirements. Equipment required to provide emergency responder radio coverage shall be listed in accordance with UL 2524. Systems, components and equipment required to provide the emergency responder radio coverage system shall comply with Sections 510.4.1 through 510.4.2.8.

CHAPTER 80 REFERENCED STANDARDS

UL 2524-2018: In-building 2-Way Emergency Radio Communication Enhancement Systems

510.4.1 Emergency responder communication enhancement system signal strength. The building shall be considered to have acceptable emergency responder communications enhancement system coverage when signal strength measurements in 95 percent of all areas and 99 percent in areas designated as critical areas by the fire code official on each floor of the building meet the signal strength requirements in Sections 510.4.1.1 through 510.4.1.3.

2021 IFC

Emergency Communications Coverage, continued

510.4.2.4 Signal booster requirements. If used, signal boosters shall meet the following requirements:

1. All signal booster components shall be contained in a National Electrical Manufacturer's Association (NEMA) 4-type waterproof cabinet.
2. Battery systems used for the emergency power source shall be contained in a NEMA 3R or higher rated cabinet.
3. Equipment shall have FCC or other radio licensing authority certification and be suitable for public safety use prior to installation.
4. Where a donor antenna exists, isolation shall be maintained between the donor antenna and all inside antennas to not less than 20dB greater than the system gain under all operating conditions.
5. ~~Bi-Directional Amplifiers (BDAs)~~ Active RF emitting devices used in emergency responder radio coverage systems shall have ~~oscillation prevention~~ built-in oscillation detection and control circuitry.

2021 IFC

Emergency Communications Coverage, continued

510.4.2.5 System monitoring. The emergency responder radio enhancement system shall be monitored by a listed *fire alarm control unit*, or where approved by the *fire code official*, shall sound an audible signal at a constantly attended on-site location. Automatic supervisory signals shall include the following:

1. Loss of normal AC power supply.
2. System battery charger(s) failure.
3. Malfunction of the donor antenna(s).
4. Failure of active RF-emitting device(s).
5. Low-battery capacity at 70-percent reduction of operating capacity.
6. Failure of critical system components.
7. The communications link between the *fire alarm system* and the emergency responder radio enhancement system.
8. Oscillation of active RF-emitting device(s)

2021 IFC

Emergency Communications Coverage, continued

510.4.2.8 Radio communication antenna density. Systems shall be engineered to minimize the near-far effect. Radio enhancement system designs shall include sufficient antenna density to address reduced gain conditions.

~~**Exceptions**~~ **Exception:**

1. ~~Class A narrow band signal booster devices with independent AGC/ALC circuits per channel.~~ Systems where all portable devices within the same band use active power control features.

2021 IFC

Emergency Communications Coverage, continued

510.5.3 Acceptance test procedure. Where an emergency responder radio coverage system is required, and upon completion of installation, the building *owner* shall have the radio system tested to verify that two-way coverage on each floor of the building is not less than 95 percent. The test procedure shall be conducted as follows:

8. Systems ~~incorporating Class B signal booster devices or Class B broadband fiber remote devices~~ shall be tested using two portable radios simultaneously conducting subjective voice quality checks. One portable radio shall be positioned not greater than 10 feet (3048 mm) from the indoor antenna. The second portable radio shall be positioned at a distance that represents the farthest distance from any indoor antenna. With both portable radios simultaneously keyed up on different frequencies within the same band, subjective audio testing shall be conducted and comply with DAQ levels as specified in Sections 510.4.1.1 and 510.4.1.2.

2021 IFC

Emergency Communications Coverage, continued

510.5 Installation requirements. The installation of the public safety radio coverage system shall be in accordance with NFPA 1221 and Sections 510.5.1 through ~~510.5.4.~~510.5.5.

510.5.1 Mounting of the donor antenna(s). To maintain proper alignment with the system designed donor site, donor antennas shall be permanently affixed on the building or where approved, mounted on a movable sled with a clearly visible sign stating "Movement or repositioning of this antenna is prohibited without approval from the fire code official". The antenna installation shall be in accordance with the applicable requirements in the International Building Code for weather protection of the building envelope.

2021 IFC/IBC

Fire Protection Systems Out of Service

901.7 Systems out of service. Where a required fire protection system is out of service, the fire department and the fire code official shall be notified immediately and, where required by the fire code official, the building shall be either evacuated or an approved fire watch shall be provided for all occupants left unprotected by the shutdown until the fire protection system has been returned to service. Where utilized, fire watches shall be provided with not less than one approved means for notification of the fire department and their only duty shall be to perform constant patrols of the protected premises and keep watch for fires.

Exception: Facilities with an approved notification and impairment management program. The notification and impairment program for water-based fire protection systems shall comply with NFPA 25.

2021 IFC/IBC

Fire Alarm System Occupant Notification System

907.2.2 Group B. A manual fire alarm system, that activates the occupant notification system in accordance with Section 907.5, shall be installed in Group B occupancies where one of the following conditions exists:

1. The combined Group B *occupant load* of all floors is 500 or more.
2. The Group B *occupant load* is more than 100 persons above or below the lowest *level of exit discharge*.
3. The *fire area* contains an ambulatory care facility.

Exception: Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

2021 IFC/IBC

520 Hz Low-Frequency Audible Alarm Signal

907.5.2.1.3 Audible signal frequency in Groups R-1 and R-2 sleeping rooms. Aubible signal frequency in Groups R-1 and R-2 occupancies shall be in accordance with Sections 907.5.2.1.3.1 and 907.2.1.3.2.

907.5.2.1.3.1 Fire alarm system signal. In sleeping rooms of Groups R-1 and R-2 Occupancies, the audible alarm activated by a fire alarm system shall be a 520 Hz low-frequency signal complying NFPA 72.

907.5.2.1.3.2 Smoke alarm signal in sleeping rooms. In sleeping rooms of Groups R-1 and R-2 Occupancies that are required by Sections 907.2.8 or 907.2.9 to have a fire alarm system, the audible alarm signal activated by single or multiple-station smoke alarms in the dwelling unit or sleeping unit shall be a 520 Hz signal complying NFPA 72. Where a sleeping room smoke alarm is unable to produce a 520 Hz signal, the 520 Hz alarm signal shall be provided by a listed notification appliance or a smoke detector with an integral 520 Hz sounder.

2021 IFC/IBC

Visible Notification in I-2 Occupancies

907.5.2.3 Visible alarms. Visible alarm notification appliances shall be provided in accordance with Sections 907.5.2.3.1 through 907.5.2.3.3.

Exceptions:

1. Visible alarm notification appliances are not required in *alterations*, except where an existing fire alarm system is upgraded or replaced, or a new fire alarm system is installed.
2. Visible alarm notification appliances shall not be required in *exits* as defined in Chapter 2.
3. Visible alarm notification appliances shall not be required in elevator cars.
4. Visual alarm notification appliances are not required in critical care areas of Group I-2, Condition 2 occupancies that are in compliance with Section 907.2.6, Exception 2.
5. A visible alarm notification appliance installed in a nurses' control station or other continuously attended staff location in a Group I-2, Condition 2 suite shall be an acceptable alternative to the installation of visible alarm notification appliances throughout the suite or unit in Group I-2, Condition 2 occupancies that are in compliance with Section 907.2.6, Exception 2.

2021 IFC/IBC

Visible Notification Appliances

907.5.2.3.3 Group R-2. In Group R-2 occupancies required by Section 907 to have a fire alarm system, each *story* that contains *dwelling units* and *sleeping units* shall be provided with the ~~future~~ capability to support future visible alarm notification appliances in accordance with Chapter 11 of ICC A117.1. Such capability shall accommodate wired or wireless equipment. ~~The future capability shall include one of the following:~~

~~1. The interconnection of the building fire alarm system with the unit smoke alarms.~~

~~2. The replacement of audible appliances with combination audible/visible appliances.~~

~~3. The future extension of the existing wiring from the unit smoke alarm locations to required locations for visible appliances.~~

2021 IFC/IBC

Visible Notification Appliances, continued

907.5.2.3.3.1 Wired equipment . Where wired equipment is used to comply with the future capability required by Section 907.5.2.3.3, the system shall include one of the following capabilities:

1. The replacement of audible appliances with combination audible/visible appliances or additional visible notification appliances.
2. The future extension of the existing wiring from the unit smoke alarm locations to required locations for visible appliances.

For wired equipment, the fire alarm power supply and circuits shall have not less than 5% excess capacity to accommodate future addition of visible alarm notification appliances, and a single access point to such circuits shall be available on every story. Such circuits shall not be required to be extended beyond a single access point on a story. The fire alarm system shop drawings required by Section 907.1.2 of the Code shall include the power supply and circuit documentation to accommodate future addition of visible notification appliances

2021 IFC/IBC

Audible Notification Appliances

907.5.2.1.2 Maximum sound pressure. The ~~maximum~~ total sound pressure level ~~for audible alarm~~ produced by combining the ambient sound pressure level with all audible notification appliances operating shall ~~be~~ not exceed 110 dBA at the minimum hearing distance from the audible appliance. Where the average ambient noise is greater than ~~95~~105 dBA, visible alarm notification appliances shall be provided in accordance with NFPA 72 and audible alarm notification appliances shall not be required.

2021 IFC/IBC

Emergency Power

907.5.2.2.5 Emergency power. Emergency voice/ alarm communications systems shall be provided with emergency power in accordance with ~~Section 1203. The system shall be capable of powering the required load for a duration of not less than 24 hours, as required in~~ NFPA 72.

1203.2.4 Emergency voice/alarm communication systems. Emergency power shall be provided for emergency voice/alarm communication systems as required in ~~Section 907.5.2.2.5. The system shall be capable of powering the required load for a duration of not less than 24 hours, as required in~~ NFPA 72.

2021 IFC/IBC

Fire Alarm System Monitoring

907.6.6 Monitoring. Fire alarm systems required by this chapter or by the *International Building Code* shall be monitored by an *approved* supervising station in accordance with NFPA 72.

Exception: Monitoring by a supervising station is not required for:

1. Single- and multiple-station smoke alarms required by Section 907.2.10.
2. Smoke detectors in Group I-3 occupancies.
3. *Automatic sprinkler systems* in one- and two-family dwellings.

907.6.6.1 ~~Automatic telephone-dialing devices.~~ ~~Automatic telephone-dialing devices used to transmit an emergency alarm shall not be connected to any fire department telephone number unless *approved* by the fire chief.~~ **Transmission of alarm signals.** Transmission of alarm signals to a supervising station shall be in accordance with NFPA 72

2021 IFC/IBC

Fire Alarm System Monitoring, continued

907.6.6.2 MIY Monitoring. Direct transmission of alarms associated with Monitor it Yourself (MIY) transmitters to a public safety answering point (PSAP) shall not be permitted unless approved by the fire code official.

2021 IEBC

In-Building Emergency Responder Radio Coverage

101.2.1 Application of fire code. Where work regulated by this code is also regulated by the construction requirements for existing buildings in Chapter 11 of the *International Fire Code* such work shall comply with applicable requirements in both codes.

2021 IEBC

CO Detection in Existing Buildings

307.1 Carbon monoxide detection. Where an addition, alteration, change of occupancy or relocation of a building is made to Group I-1, I-2, I-4 and R occupancies and classrooms of Group E occupancies, the existing building shall be provided with carbon monoxide detection in accordance with Section 1103.9 of the International Fire Code or Section R315 of the International Residential Code.

Exceptions:

1. Work involving the exterior surfaces of buildings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of porches or decks.
2. Installation, alteration or repairs of plumbing or mechanical systems, other than fuel-burning appliances.
3. Work classified as Level 1 Alterations in accordance with Chapter 7.

2021 NFPA CODE CHANGES

2021 NFPA 1 AND NFPA 101

Carbon Monoxide Detection in Large Board and Care Facilities

32.3.3.4.9 Carbon Monoxide ~~**Alarms and Carbon Monoxide**~~ Detection ~~**Systems.**~~

32.3.3.4.9.1 Carbon ~~monoxide alarms or carbon~~ monoxide detectors in accordance with Section 9.12 and 32.3.3.4.9 shall be provided ~~in new large board and care facilities where either~~ where any of the following conditions ~~exists~~ exist:

1) Where ~~large board and care~~ facilities have communicating attached garages, unless otherwise exempted by 32.3.3.4.9.3
2) Where ~~sleeping rooms or sleeping room suites contain~~ fuel-burning appliances or fuel-burning fireplaces are in the facility

2021 NFPA 1 AND NFPA 101

Risk Analysis for Mass Notification Systems

Existing K-12 Schools

15.3.4.5 Risk Analysis for Mass Notification Systems. A risk analysis in accordance with Section 9.14 shall be performed to determine if a mass notification system is required upon replacement of the building fire alarm system.

2021 NFPA 1 AND NFPA 101

Low Frequency Audible Alarm Signal

9.6.2.10.3 Smoke Alarms in Sleeping Rooms.

9.6.2.10.3.1 In new construction, where required by Chapters 11 through 43, the alarm notification signal in sleeping rooms resulting from activation of smoke alarms shall be a 520 Hz low-frequency signal complying with NFPA 72.

9.6.3.3 Where required by Chapters 11 through 43, the audible alarm notification signal provided in sleeping rooms resulting from the activation of the fire alarm system or sleeping room smoke detector shall be a 520 Hz low-frequency signal complying with NFPA 72.

2021 NFPA 1 AND NFPA 101

Low Frequency Audible Alarm Signal, continued

New Hotels and Dormitories

28.3.4.3.2 In hotels and dormitories that are required by 28.3.4 to have a fire alarm system, the audible alarm notification signal provided in sleeping rooms of guest rooms or guest suites that is activated by the fire alarm system shall be a 520 Hz low-frequency signal in accordance with 9.6.2.10.3.

28.3.4.6.1 In hotels and dormitories that are required by 28.3.4 to have a fire alarm system, the audible alarm notification signal provided in sleeping rooms of guest rooms or guest suites that is activated by smoke alarms shall be a 520 Hz low-frequency signal in accordance with 9.6.2.10.3.

2021 NFPA 1 AND NFPA 101

Low Frequency Audible Alarm Signal, continued

New Apartment Buildings

30.3.4.3.2 In apartment buildings that are required by 30.3.4.1 to have a fire alarm system, the audible alarm notification signal provided in sleeping rooms of dwelling units that is activated by the fire alarm system shall be a 520 Hz low-frequency signal in accordance with 9.6.3.9.

30.3.4.5.1 In apartment buildings that are required by 30.3.4 to have a fire alarm system, the audible alarm notification signal provided in sleeping rooms that is activated by smoke alarms shall be a 520 Hz low-frequency signal in accordance with 9.6.2.10.3.

2021 NFPA 1

In-Building Emergency Responder Coverage

11.10* ~~Two-Way Radio~~ In-Building Emergency Responder Communication Enhancement Systems.

11.10.1 Permits.

11.10.1.1 Where required by the AHJ, an installation permit shall comply with Section 1.12.

11.10.1.2 Where required by the AHJ, a renewable permit in accordance with 9.6.6.2 of NFPA 1221 shall be issued at the conclusion of successful acceptance testing.

11.10.~~1.~~2 General. In all new and existing buildings, minimum radio signal strength for emergency services department communications shall be maintained at a level determined by the AHJ.

2021 NFPA 1

In-Building Emergency Responder Coverage, continued

11.10.3 In-building emergency responder communication enhancement systems shall comply with the design, installation, testing, inspection, and maintenance requirements in Section 9.6 of NFPA 1221 and 11.10.3.1 through 11.10.5 of this *Code*.

11.10.3.1 Listed and Labeled. In-building emergency responder communication enhancement systems installed within buildings shall be listed and labeled in accordance with UL 2524, *In-building 2-Way Emergency Radio Communication Enhancement Systems*.

11.10.3.2* In-building emergency responder communication enhancement systems capable of operating on frequencies licensed to any public safety agency by the Federal Communications Commission (FCC) or other radio licensing authority shall not be installed without prior coordination and approval of the AHJ.

2021 NFPA 1

In-Building Emergency Responder Coverage, continued

11.10.4* Lightning Protection. Systems shall have lightning protection that complies with NFPA 780.

11.10.5 Enclosures. All repeater, transmitter, receiver, signal booster components, optical-to-RF and RF to- optical converters, external filters, batteries, and battery system components shall be contained in a NEMA4- or NEMA 4X-type enclosure(s).

11.10.5.1 Batteries that require venting shall be stored in NEMA3R-type enclosures.

11.10.6 Oscillation Detection and Control. Bi-directional amplifiers (BDAs) used in in-building emergency responder radio communication enhancement coverage systems shall have oscillation detection and control circuitry.

2021 NFPA 1

In-Building Emergency Responder Coverage, continued

11.10.7* Minimum Signal Strength into the Building. In addition to the requirements in 9.6.8.1 of NFPA 1221, the inbound signal strength shall be a minimum of -95 dBm throughout the coverage area and sufficient to provide not less than a delivered audio quality (DAQ) of 3.0 or an equivalent signal-to-interference-plus-noise ratio (SINR) applicable to the technology for either analog or digital signals.

11.10.8.1 To maintain proper alignment with the system designed donor site, donor antennas shall meet one of the following:

1) Antennas shall be permanently affixed on the building.
2) Where approved, antennas shall be mounted on a movable sled with a visible sign stating “Movement or repositioning of this antenna is prohibited without approval from the AHJ.”

2021 NFPA 1

In-Building Emergency Responder Coverage, continued

11.10.8.2 The antenna installation shall also be in accordance with the applicable requirements of the building code for weather protection of the building envelope.

11.10.9.1* In-building emergency responder communication enhancement systems shall be engineered to minimize the near-far effect.

11.10.11 Acceptance Test Procedure. Where an in-building emergency responder communication enhancement system is required, the building owner shall have the system tested on completion of installation to verify that two-way coverage on each floor of the building is not less than the coverage specified in 9.6.7.3 or 9.6.7.4 of NFPA 1221 as applicable.

2021 NFPA 1

In-Building Emergency Responder Coverage, continued

11.10.11.1 Test Procedure. The test procedure, as required by 11.10.11, shall be conducted as follows:

1) Each floor of the building shall be divided into a grid of 20 approximately equal test areas.
2) The test shall be conducted using a calibrated portable radio of the latest brand and model used by the agency talking through the agency's radio communications system or equipment approved by the AHJ.
3) Failure of more than one test area shall result in failure of the test.
4) A test location approximately in the center of each test area shall be selected for the test, with the radio enabled to verify two-way communications to and from the outside of the building through the public agency's radio communications system, as follows:
   a) Once the test location has been selected, that location shall represent the entire test area
   b) Failure in the selected test location shall be considered to be a failure of that test area and additional test locations shall not be permitted.

2021 NFPA 1

In-Building Emergency Responder Coverage, continued

5) All signal boosters or amplifiers shall be tested to verify that the gain is the same as it was upon initial installation and acceptance or set to optimize the performance of the system under all operating conditions.
6) At the time of installation and at subsequent annual inspections, a spectrum analyzer or other suitable test equipment shall be utilized to ensure spurious oscillations are not being generated by the subject signal booster.
7) Systems shall be tested using two portable radios simultaneously conducting subjective voice quality checks, as follows:

a) One portable radio shall be positioned not more than 10 ft (3048 mm) from the indoor antenna.
a) The second portable radio shall be positioned at a distance that represents the farthest distance from any indoor antenna
b) With both portable radios simultaneously keyed up on different frequencies within the same band, subjective audio testing shall be conducted and comply with DAQ levels as specified in 9.6.8.1 or 9.6.8.2 of NFPA 1221 as applicable.

Time for Questions!

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