



Ceiling Radiation Dampers: An In-Depth Look

AMCA *insite*™ Webinar Series | AMCA International | www.amca.org

Lisa Cherney

Education Manager, AMCA International
Webinar Moderator

- Joined AMCA in February 2019
- Responsible for development of AMCA's education programs; staff liaison for the Education & Training Committee
- Projects include webinars, online education modules, presentations at trade shows, AMCA Speakers Network and other duties as assigned.



Introductions & Guidelines

- Participation Guidelines:
 - Audience will be muted during the webinar.
 - Questions can be submitted anytime via the GoToWebinar platform and will be addressed at the end of the presentation.
 - Reminder: This webinar is being recorded!
 - To earn PDH credit for today, please stay clicked onto the webinar **for the entire hour**.
 - A post-webinar evaluation will be emailed to everyone within one day, and it must be completed to qualify for today's PDH credit.

Q & A

To submit questions:

- From the attendee panel on the side of the screen, select the “Questions” drop down option.
 - Type your question in the box and click “Send”.
- Questions will be answered at the end of the program.
- If all of today’s questions are not able to be answered live, options will be provided at the end for further follow up.

AMCA International has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.

*Attendance for the entire presentation
AND a completed evaluation are required
for PDH credit to be issued.*



DISCLAIMER

The information contained in this webinar is provided by AMCA International as an educational service and is not intended to serve as professional engineering and/or manufacturing advice. The views and/or opinions expressed in this educational activity are those of the speaker(s) and do not necessarily represent the views of AMCA International. In making this educational activity available to its members and others, AMCA International is not endorsing, sponsoring or recommending a particular company, product or application. Under no circumstances, including negligence, shall AMCA International be liable for any damages arising out of a party's reliance upon or use of the content contained in this webinar.

COPYRIGHT MATERIALS

This educational activity is protected by U.S. and International copyright laws. Reproduction, distribution, display and use of the educational activity without written permission of the presenter is prohibited.

© AMCA International 2021

Michael Bulzomi

Director of Marketing- Louvers and Dampers, AMCA Member Company

- Over 15 years experience in the HVAC industry
- Has held positions in sales, marketing and application engineering across the U.S. for HVAC product manufacturers and Sales Reps
- Holds an MBA, and a Bachelors in Earth Science and Atmospheric Science
- Active member of ASHRAE, NFPA & AMCA, serving on multiple committees



Ceiling Radiation Dampers: An In-Depth Look

Purpose and Learning Objectives

The purpose of this presentation is to provide an overview of Ceiling Radiation Damper types and their ratings.

At the end of this presentation, you will be able to:

1. Identify the difference between a UL555C rated Ceiling Radiation Damper and a UL263 rated assembly that includes a Ceiling Radiation Damper.
2. Explain how to identify and read a UL Floor-Ceiling or Roof-Ceiling design.
3. Describe the difference between a Fire Damper and a Ceiling Radiation Damper.
4. Explain what Dynamic Rating is for Ceiling Radiation Dampers and what limitations exist in the market today.

Agenda

- What is a Ceiling Radiation Damper
- Different Types of Ceiling Radiation Dampers
- Differences from other Life Safety Dampers
- UL Floor/Ceiling & Roof/Ceiling Design Review
- How to Identify Ceiling Radiation Dampers
- How to Select the Appropriate Ceiling Radiation Damper




What...
is a Ceiling Radiation Damper?

What is a Ceiling Radiation Damper?

- **Definition of a Ceiling Damper per NFPA Standard 90A**


“A device installed to limit radiant heat transfer through an air outlet or air inlet opening in the ceiling of a floor-or roof-ceiling assembly having not less than a 1 hour fire resistance rating.”

A rose by any other name...

- Ceiling Radiation Damper
- Radiation Damper
- CRD
- Ceiling Radiation Fire Damper
- Wood Truss Ceiling Radiation Damper
- Fire Rated Wood Truss Damper
- Wood Joist Damper
- Fire Stop Flaps 

Ceiling Radiation Dampers get installed in:

- Behind diffusers, grilles, and exhaust fans in ceilings
- Supply and return air ceiling membrane penetrations for above ceiling (or in attic) Furnaces/ERV/Fan Coils/Heat Pumps, etc...
- Supply and return air ceiling membrane penetrations for in closet Furnace/ERV/Fan Coil/Heat Pumps, etc...
- **NOTE: Single floor penetrations only**
Cannot use duct to create a “shaft” or multi-floor ducted penetration.



How...

does a Ceiling Radiation Damper
protect an assembly?

Limits radiant heat transfer above the ceiling

Designed to limit the transfer of radiant heat to protect structural integrity of floor/ceiling or roof/ceiling assembly above it.

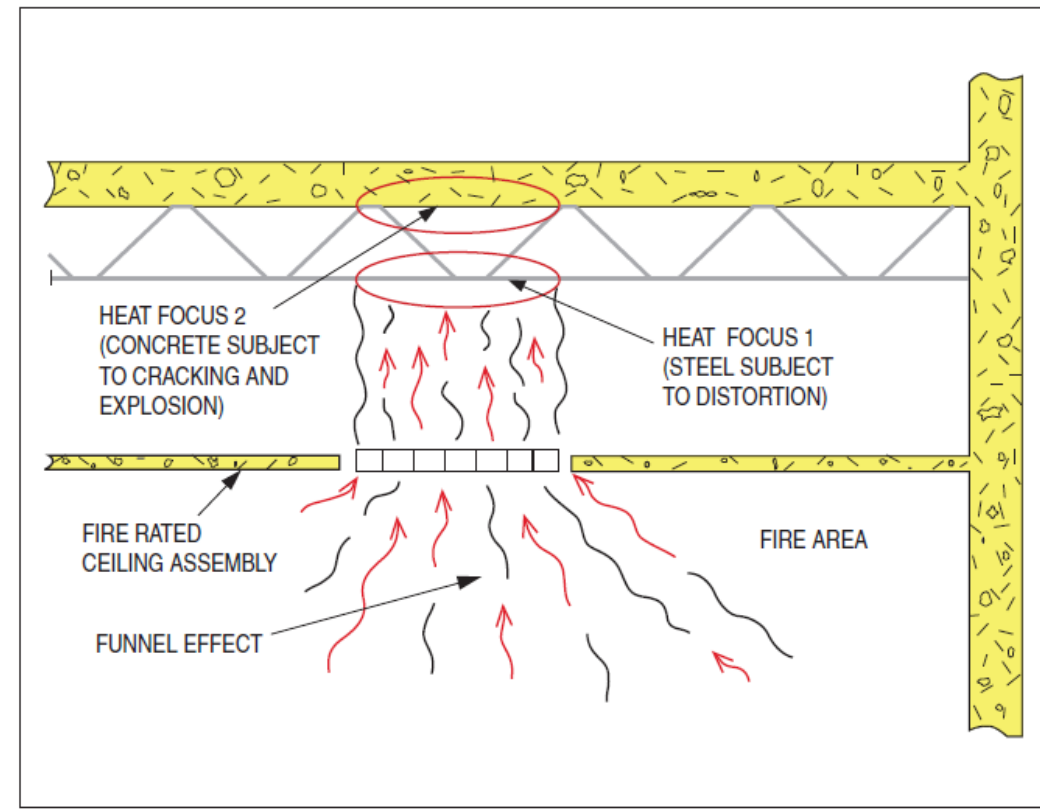


FIGURE 1



What...

are the different types of
Ceiling Radiation Dampers?

For Use in Lieu of Hinged Door Type Dampers

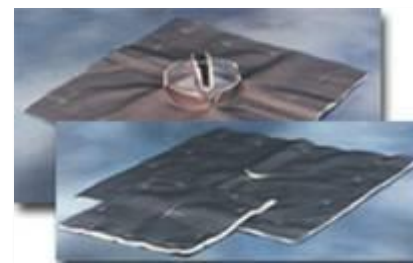
- Tested for use in those UL fire resistive designs that indicate the use of a **hinged door type damper**
- Tested and classified to **UL 555C**



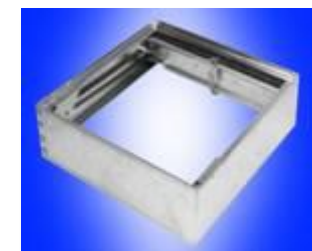
Butterfly Type Square
or Rectangular



Adjustable volume
control option



Damper and Thermal Blanket



Curtain Type

For use in specific floor/ceiling or roof/ceiling designs

- Tested for use only in one or more specific UL fire-resistive floor/ceiling or roof/ceiling designs
- Commonly used in multi-family dwellings, nursing homes, smaller hotels and motels, etc.
- Tested and classified to **UL 263**



For use in specific UL floor/ceiling or roof/ceiling designs

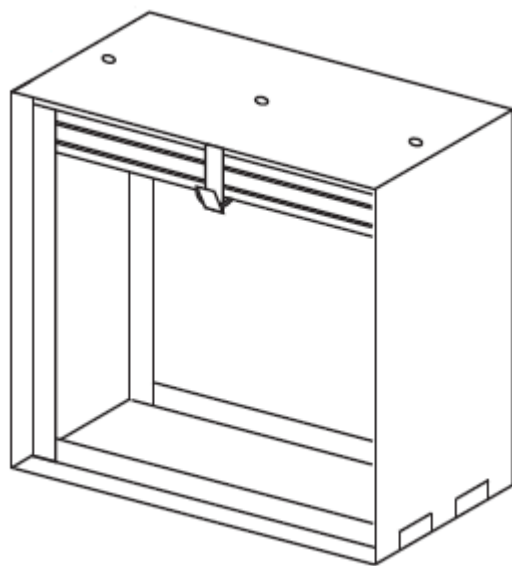
- These designs can be “**proprietary**”, meaning the listing is owned by a damper manufacturer and only their products have been tested and approved for use under that design number.
- Or they can be “**open**”, typically owned by a gypsum board manufacturer where multiple manufacturers of dampers have been tested and are approved for use under that design number.



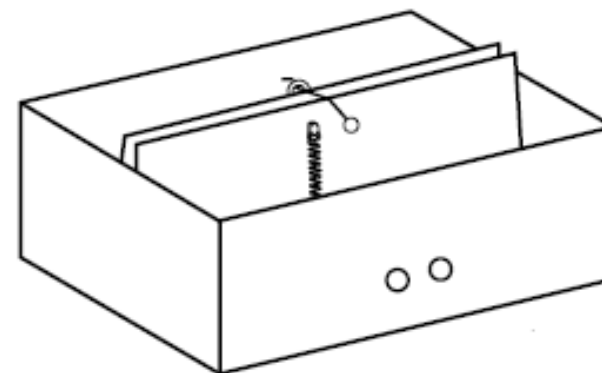
What...
is the difference?

Between a Fire Damper & Ceiling Damper?

- Limits Flame (UL555)
- Limits Heat (UL555C)



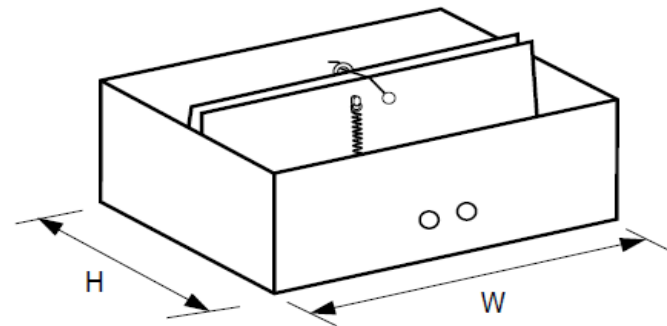
Fire Damper



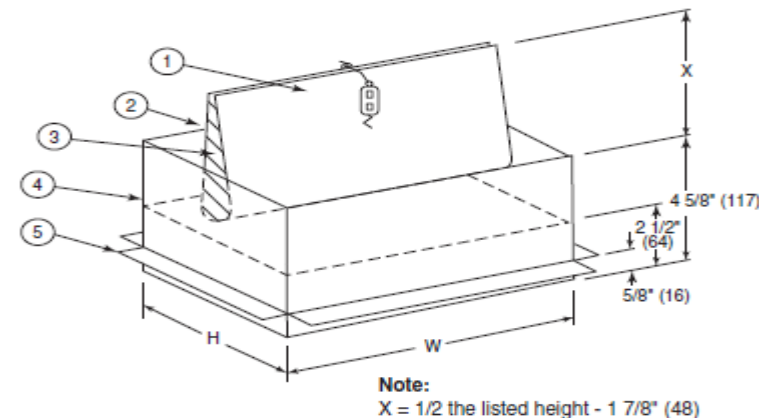
Ceiling Radiation Damper

Between a CRD and Wood Truss CRD?

- For installation in ceiling penetration with an air outlet and thermal blanket (fire rated t-bar or gypsum board) (**UL555C**).
- Part of a specific assembly usually in conjunction w/a factory or field supplied boot (by others) (**UL263**).



Ceiling Radiation Damper



Wood Truss
Ceiling Radiation Damper

Differences continued...

The application of ceiling radiation dampers versus horizontal fire dampers, smoke dampers, combination fire-smoke dampers and corridor dampers are distinctly different.

- Dampers may be constructed differently
 - Different frame and/or blade gauges
 - May or may not require blade insulation
- Different installation methods/requirements
- Ceiling Dampers for Wood Truss are assemblies and usually require a Factory supplied or Field Supplied boot (by others) constructed per manufacturers IOM.
- And most importantly...the different UL classifications have different UL labels – they are tested and approved for different applications!



What...

do the UL designs look like?

Design that allows a UL 555C Rated Ceiling Damper

Design No. G526

July 28, 2017

Restrained Assembly Rating — 2 Hr.

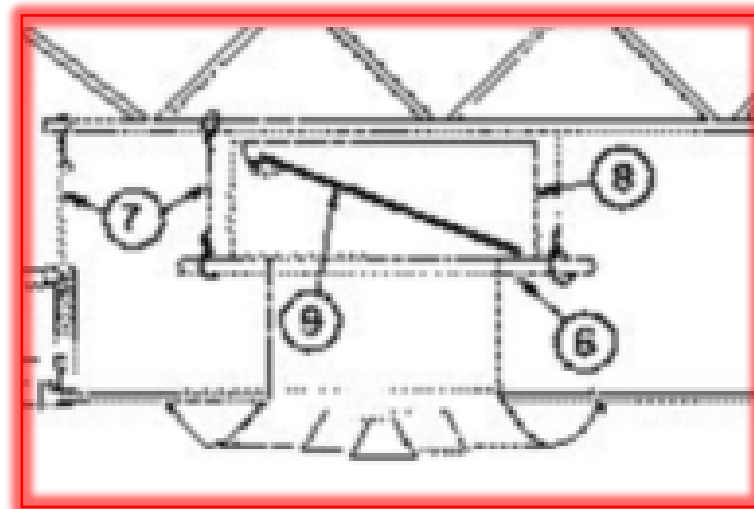
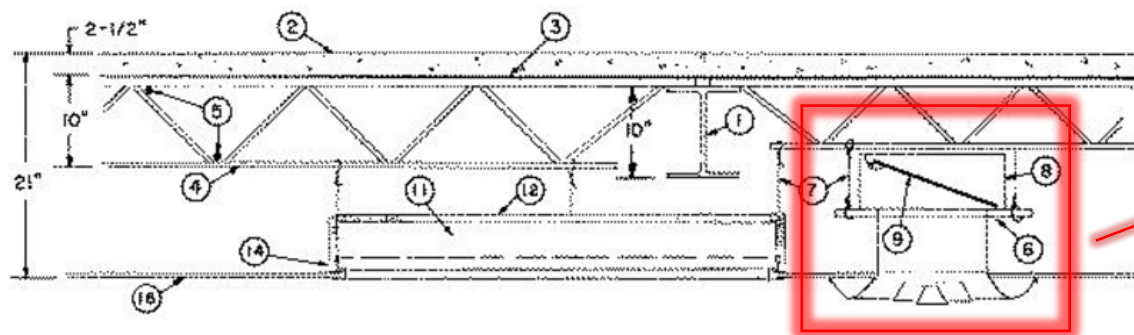
Unrestrained Assembly Ratings — 1-1/2 and 2 Hr.

(See Item 14B)

Unrestrained Beam Rating — 2 Hr.

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide [BXUV](#) or [BXUV7](#)

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



Listing that allows a UL 263 Ceiling Damper assembly for use in Wood Truss Ceiling

Design No. L550

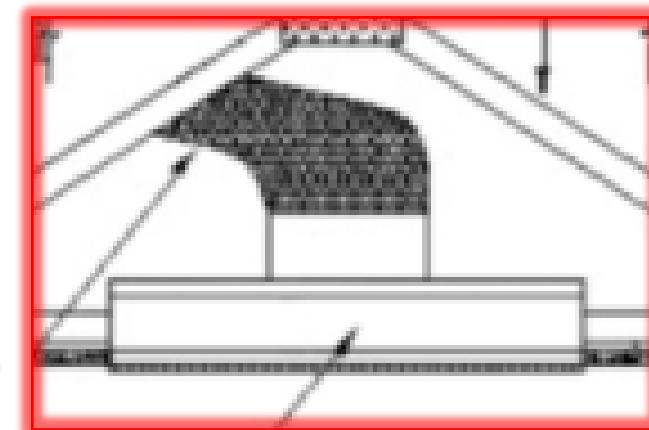
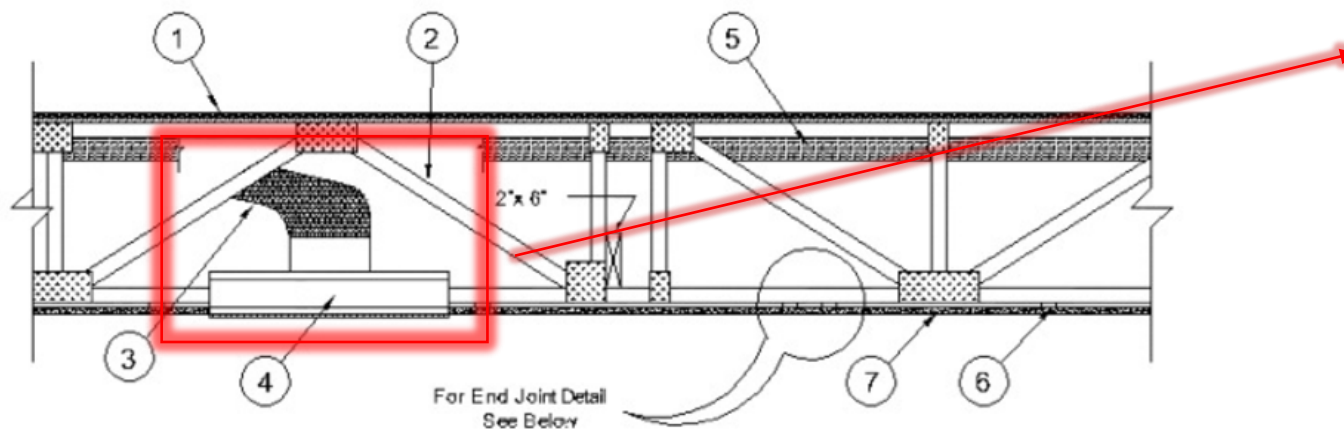
September 12, 2016

Unrestrained Assembly Rating — 1 Hr.

Finish Rating — 23 Min (See Items 5 or 5A)

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide [BXUV](#) or [BXUV7](#)

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



UL555C vs. UL263

There are several notable differences but always remember:

- **UL555C** Ceiling Dampers are intended for use in **sheet metal air duct outlets** which penetrate the ceilings of hourly-rated fire resistive assemblies (**in lieu of hinged plate dampers**).
- **UL263** Ceiling Radiation Dampers are part of an assembly intended for installation in **specific** fire resistive assemblies (**i.e. wood truss ceilings**).

What...

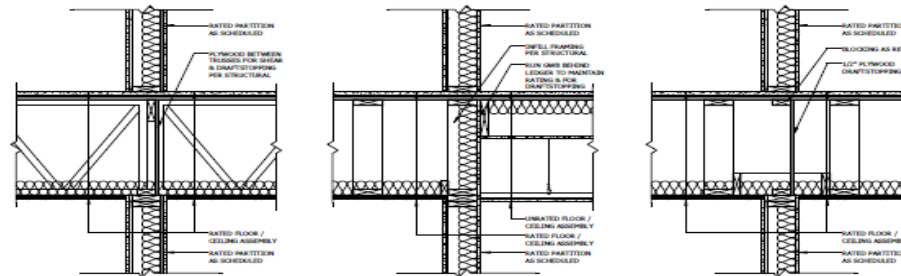
do I look for on Mechanical Plans?

Check the Architectural A set...

Look for the following:

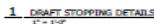
- Life Safety Plans
- Partition Plans
- Assembly Details
- Floor Elevations
- Building Section Details

Check the Architectural A set...

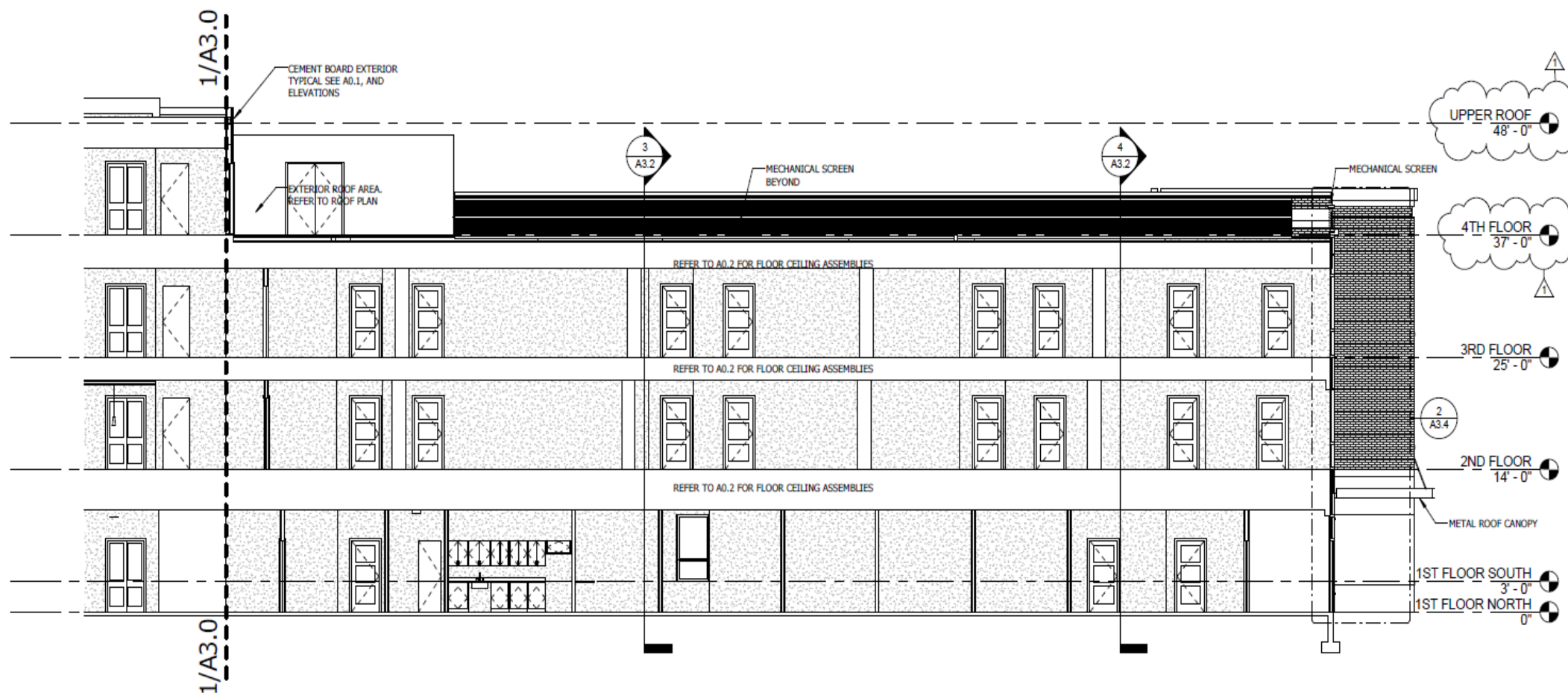


1. DRAFT STOPPING DETAILS
1" = 1'-0"

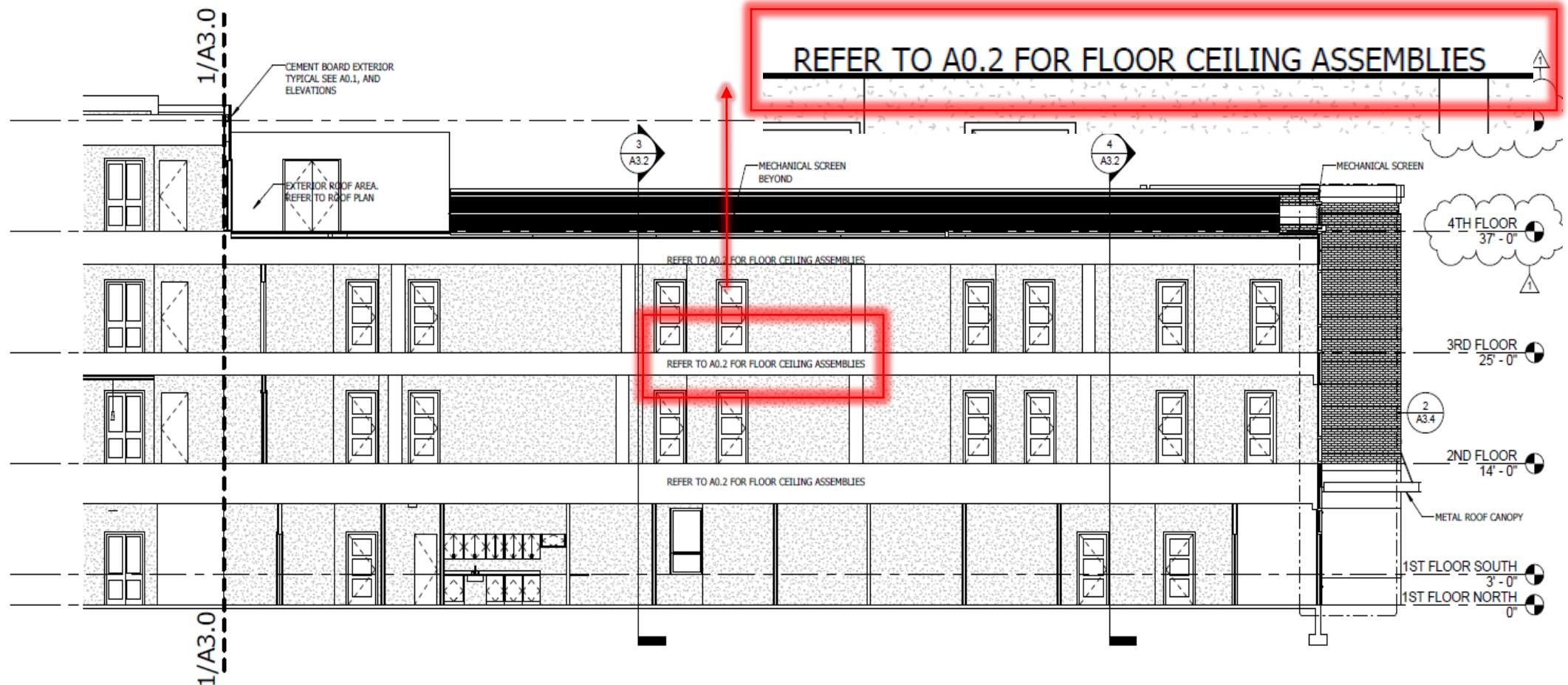
FLOOR / CEILING ASSEMBLIES	ROOF ASSEMBLIES
<p>1. FLOOR TYPICAL FLOOR ASSEMBLY - 10.1.1.1</p> <p>STC 50 MIN IIC 50 MIN</p> <ul style="list-style-type: none"> FINISHED FLOOR AS SCHEDULED 1/4" GYPSUM-CONCRETE TOPPING FLOOR MAT 1/4" GYPSUM FLOOR SHEATHING WOOD FLOOR TRUSSES PER STRUCTURAL 1" GYPSUM INSULATION OVER RESIDENT CHANNEL 1" GYPSUM INSULATION UNDER RESIDENT CHANNEL 1/4" GYPSUM WALL BOARD <p>2. FLOOR TYPICAL FLOOR ASSEMBLY - 10.1.1.2</p> <p>STC 50 MIN IIC 50 MIN</p> <ul style="list-style-type: none"> FINISHED FLOOR AS SCHEDULED 1/4" GYPSUM-CONCRETE TOPPING FLOOR MAT 1/4" GYPSUM FLOOR SHEATHING WOOD FLOOR TRUSSES PER STRUCTURAL 1" GYPSUM INSULATION 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 2 LAYERS 5/8" TYPE 1" GYPSUM WALL BOARD <p>3. FLOOR CORNER FLOOR ASSEMBLY - 10.1.1.3</p> <ul style="list-style-type: none"> FINISHED FLOOR AS SCHEDULED 1/4" GYPSUM-CONCRETE TOPPING FLOOR MAT 1/4" GYPSUM FLOOR SHEATHING WOOD FLOOR TRUSSES PER STRUCTURAL 1" GYPSUM INSULATION 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 2 LAYERS 5/8" TYPE 1" GYPSUM WALL BOARD <p>4. FLOOR CORNER FLOOR ASSEMBLY - 10.1.1.4</p> <ul style="list-style-type: none"> FINISHED FLOOR AS SCHEDULED 1/4" GYPSUM-CONCRETE TOPPING FLOOR MAT 1/4" GYPSUM FLOOR SHEATHING WOOD FLOOR TRUSSES PER STRUCTURAL 1" GYPSUM INSULATION 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 2 LAYERS 5/8" TYPE 1" GYPSUM WALL BOARD <p>5. FLOOR CORNER FLOOR ASSEMBLY - 10.1.1.5</p> <ul style="list-style-type: none"> FINISHED FLOOR AS SCHEDULED 1/4" GYPSUM-CONCRETE TOPPING FLOOR MAT 1/4" GYPSUM FLOOR SHEATHING WOOD FLOOR TRUSSES PER STRUCTURAL 1" GYPSUM INSULATION 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 2 LAYERS 5/8" TYPE 1" GYPSUM WALL BOARD 	<p>1. ROOF TYPICAL ROOF ASSEMBLY - 10.1.1.1</p> <p>STC 50 MIN IIC 50 MIN</p> <ul style="list-style-type: none"> FINISHED ROOF AS SCHEDULED 1/4" GYPSUM-CONCRETE TOPPING FLOOR MAT 1/4" GYPSUM FLOOR SHEATHING WOOD FLOOR TRUSSES PER STRUCTURAL 1" GYPSUM INSULATION OVER RESIDENT CHANNEL 1" GYPSUM INSULATION UNDER RESIDENT CHANNEL 1/4" GYPSUM WALL BOARD <p>2. ROOF TYPICAL ROOF ASSEMBLY - 10.1.1.2</p> <ul style="list-style-type: none"> FINISHED ROOF AS SCHEDULED 1/4" GYPSUM-CONCRETE TOPPING FLOOR MAT 1/4" GYPSUM FLOOR SHEATHING WOOD FLOOR TRUSSES PER STRUCTURAL 1" GYPSUM INSULATION 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 2 LAYERS 5/8" TYPE 1" GYPSUM WALL BOARD <p>3. COLUMN ASSEMBLY - 10.1.1.3</p> <p>STC 50 MIN IIC 50 MIN</p> <ul style="list-style-type: none"> FINISHED FLOOR AS SCHEDULED 1/4" GYPSUM-CONCRETE TOPPING FLOOR MAT 1/4" GYPSUM FLOOR SHEATHING WOOD FLOOR TRUSSES PER STRUCTURAL 1" GYPSUM INSULATION 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 2 LAYERS 5/8" TYPE 1" GYPSUM WALL BOARD <p>4. BEAM ASSEMBLY - 10.1.1.4</p> <p>STC 50 MIN IIC 50 MIN</p> <ul style="list-style-type: none"> FINISHED FLOOR AS SCHEDULED 1/4" GYPSUM-CONCRETE TOPPING FLOOR MAT 1/4" GYPSUM FLOOR SHEATHING WOOD FLOOR TRUSSES PER STRUCTURAL 1" GYPSUM INSULATION 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 1 LAYER 5/8" TYPE 1" GYPSUM WALL BOARD 2 LAYERS 5/8" TYPE 1" GYPSUM WALL BOARD



Check the Architectural A set...



Check the Architectural A set...

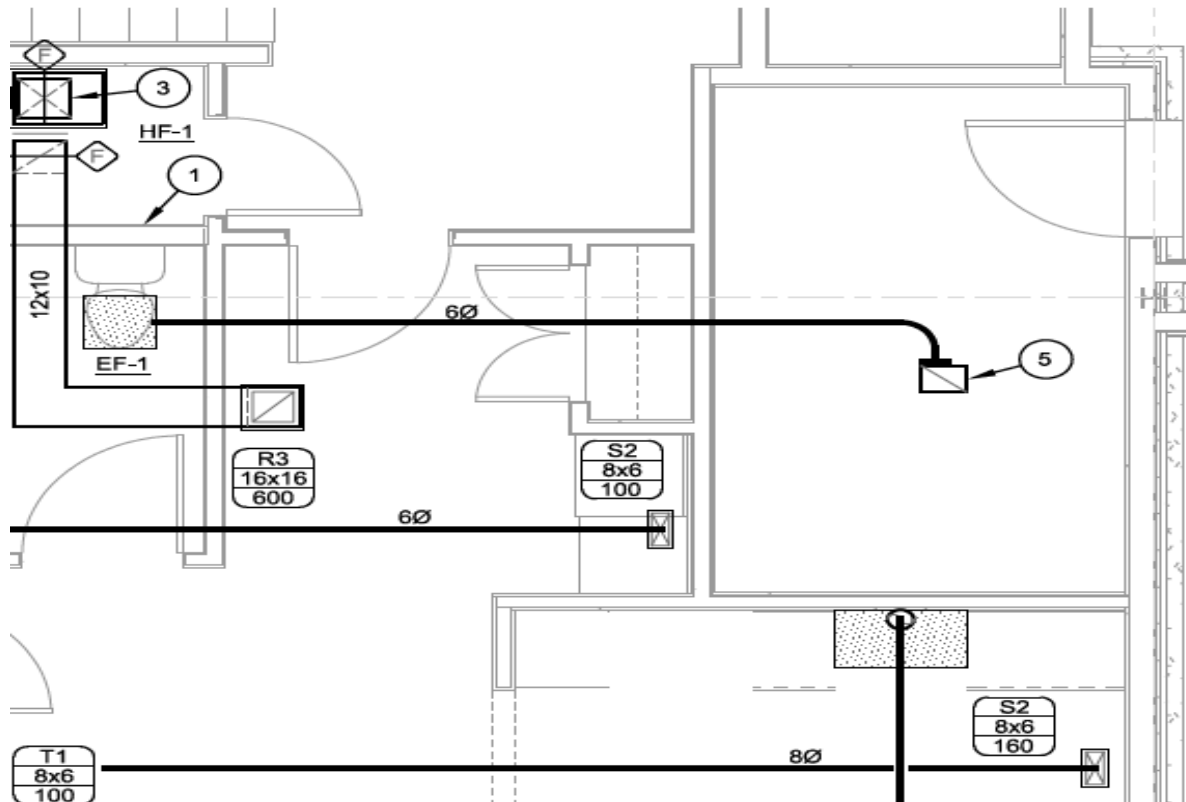


Check the Mechanical M set...

Looking for:

- Key Notes
- Schedule Notes
- Product Detail Drawings

Check the Mechanical M set...

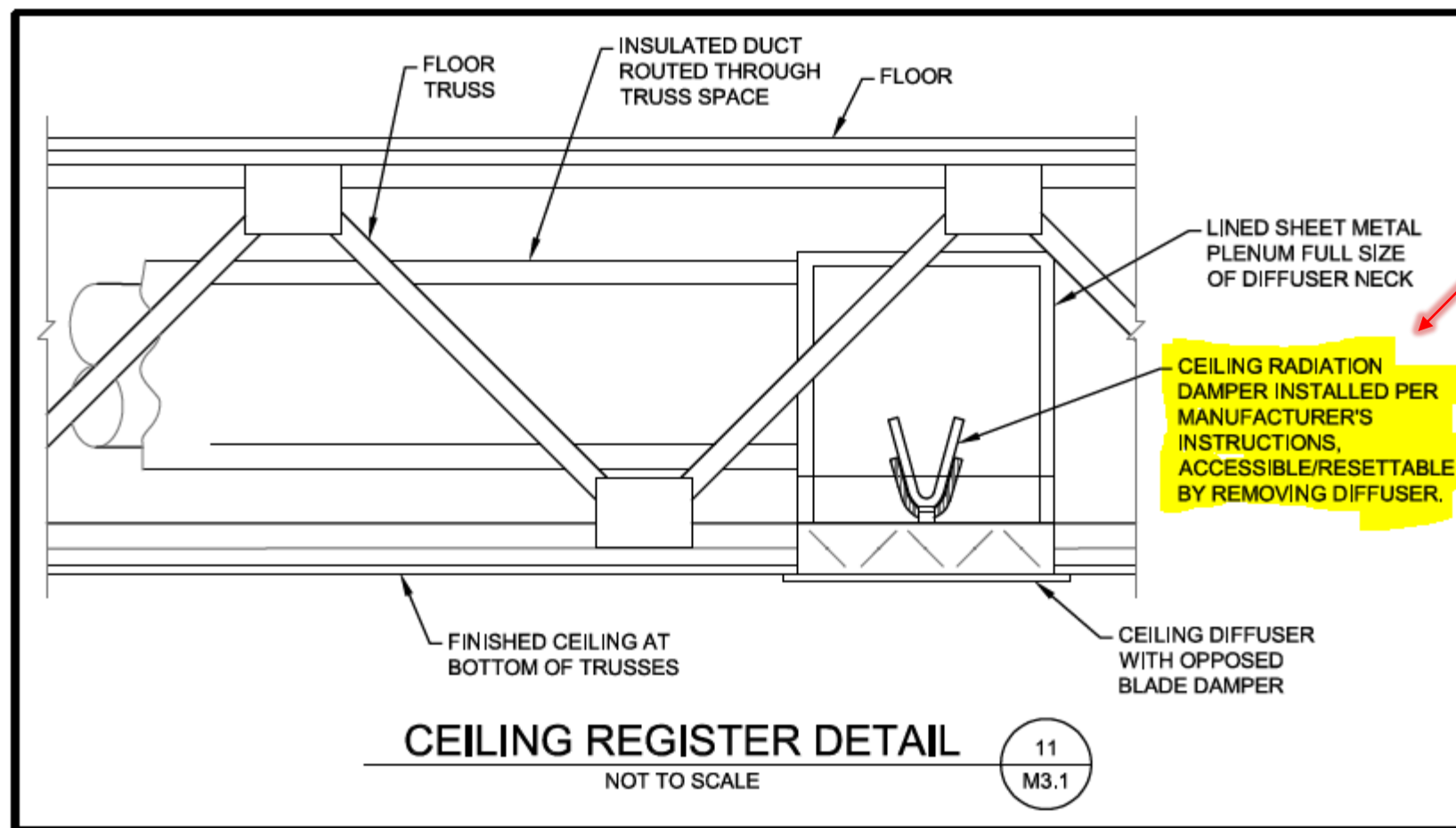


KEY NOTES

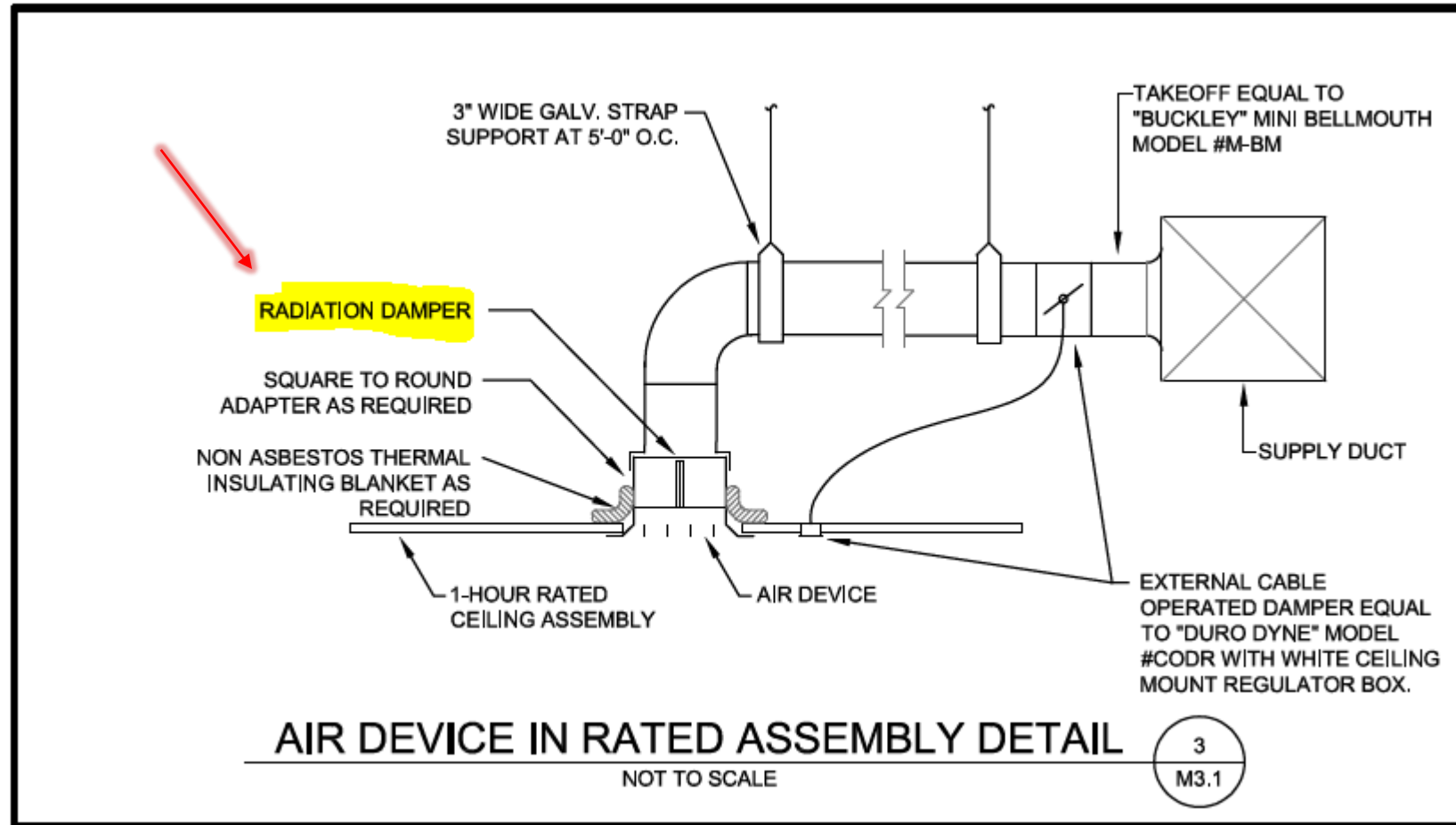
INDICATED BY SYMBOLS ①, ②, ETC.

1. COORDINATE DUCTWORK WITH WATER HEATER AND PIPING IN THIS AREA. SEE ENLARGED MECHANICAL CLOSET PLAN SHEET P2.4.
2. 8x6 EXHAUST AIR DUCT AT 1ST AND 2ND FLOOR, 8x10 AT 3RD AND UP TO UNIT F ON 4TH FLOOR OR TO ROOF TERMINATION.
3. 12x12 SUPPLY AIR DUCT FROM FURNACE UP BETWEEN JOISTS TO ROUND DUCT CONNECTION. COORDINATE WITH STRUCTURE.
4. CENTER 8x6 TRANSFER DUCT ABOVE DOOR WITH TRANSFER GRILLE ON EACH SIDE.
5. 6x8 EXHAUST AIR DUCT AT 1ST AND 2ND FLOOR, 10x8 AT 3RD AND 4TH FLOOR AND UP TO ROOF TERMINATION.
6. PROVIDE A RADIATION DAMPER AT EACH SUPPLY, RETURN, AND TRANSFER GRILLE THAT PENETRATES THE RATED CEILING ASSEMBLY. SEE DETAIL 4/M3.1.
7. 8x6 AT 2ND AND 3RD FLOOR, UP TO UNIT H ON 4TH FLOOR.
8. 10x5 EXHAUST AIR BETWEEN STUDS AT 2ND AND 3RD FLOOR, UP TO ROOF TERMINATION. PROVIDE FIRE DAMPER AT EACH RATED ASSEMBLY WITH ACCESS PANELS.
9. 6x6 TRANSFER DUCT ABOVE CEILING TO TRANSFER GRILLES IN CEILING. PROVIDE RADIATION DAMPERS AT FIRE RATED CEILING.

Check the Mechanical M set...



Check the Mechanical M set...

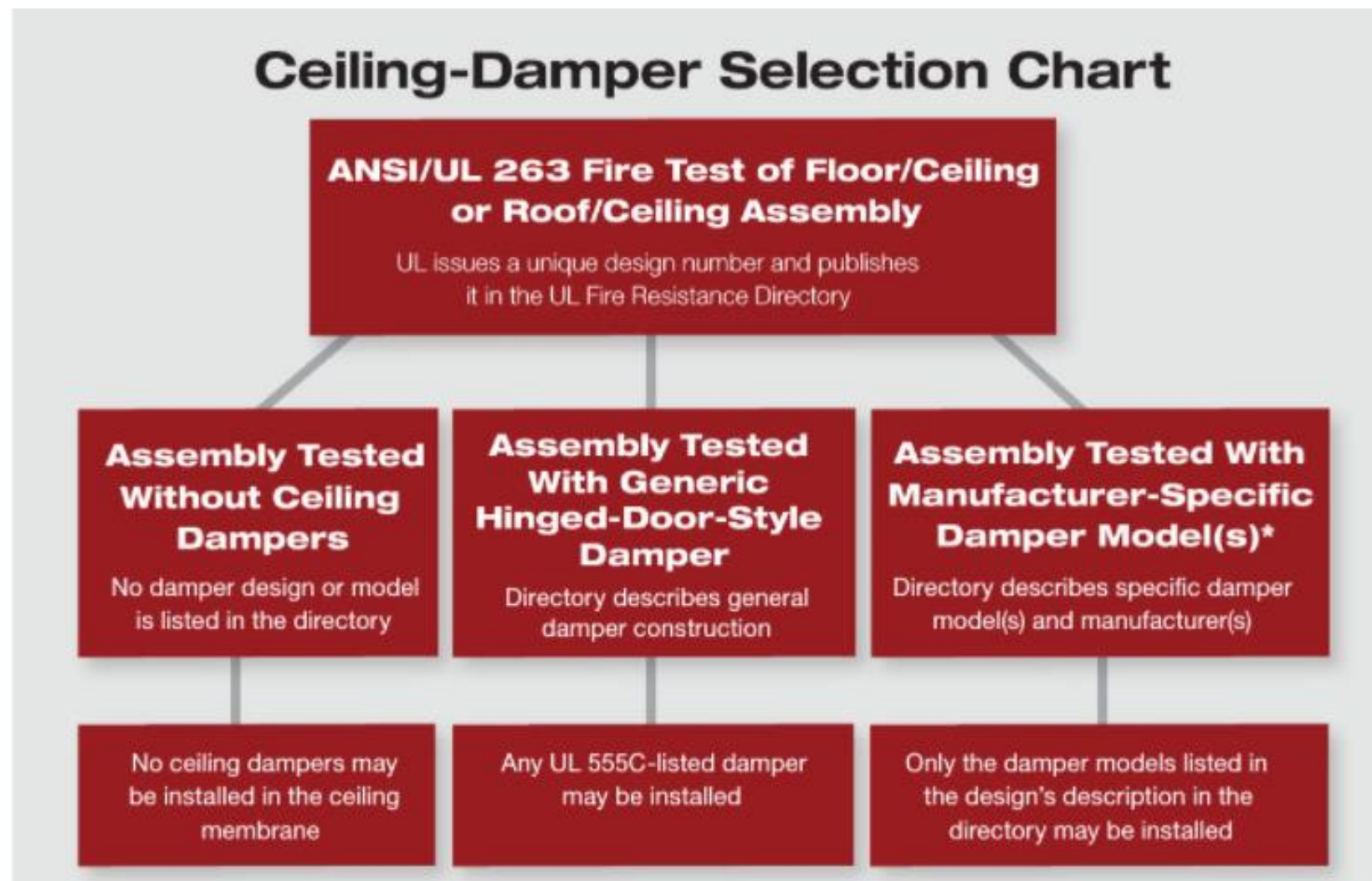




How...

to select the appropriate damper?

Ceiling Damper Selection



Gypsums Association's Fire Resistance Design Manual

- Design numbers found in the Gypsum Association's manual are commonly specified.
- However – the Gypsum Association is NOT a testing agency. The listings contained in the manual are based on test data from various accredited 3rd party labs, all of which test to UL263.
- Some of the listings are proprietary to the manufacturer of the gypsum board, they are not in respect to the damper.
- Ceiling dampers that are approved for use in specific Gypsum Associate designs can be determined by referring to the test reports and/or design numbers of the testing agency.



What...

is a Dynamic Ceiling Radiation Damper?

Static vs. Dynamic Systems

- Static systems can be defined as systems that are designed to shut fans off during a fire emergency.
- Dynamic systems can be defined as systems that are designed to have fans on during a fire emergency.
 - This can be either an engineered smoke control system where a series of fans, dampers, and other devices can be used to control the movement of smoke in a fire emergency,
 - But can also be a system where unitary heating & cooling devices are not equipped with a means to stop their fans from running in the event of a fire emergency.

Static vs. Dynamic Systems

- Until recently, all Ceiling Radiation Dampers available were Static rated and used in all applications.
- Underwriters Laboratory (UL) has devised a test method and begun a program to test and certify Dynamically rated Ceiling Radiation Dampers.
- Ceiling dampers now indicate on their published UL Certifications available if they are for use in static systems or for use in dynamic systems.

Dynamic Ceiling Radiation Dampers

- Rated for specific airflow and pressures as indicated by the table below.
- Also rated for airflow directionality - either upflow or downflow.

Re: UL 555C, Table 10.1
Test airflow and pressure conditions

Rated airflow and pressure		Minimum test airflow and pressure	
Airflow, fpm (m/s)	Pressure, inches of water (kPa)	Airflow, fpm (m/s)	Pressure, inches of water (kPa)
500 (2.54)	1 (.25)	600 (3.05)	1.125 (.280)
1000 (5.10)	1 (.25)	1200 (6.10)	1.125 (.280)
1500 (7.62)	1 (.25)	1800 (9.15)	1.125 (.280)
2000 (10.20)	1 (.25)	2400 (12.20)	1.125 (.280)

Dynamic Ceiling Radiation Dampers

- It should be noted that the current availability of Floor/Ceiling and Roof/Ceiling designs is limited to 1 manufacturer, and it is a “proprietary” listing.
 - Only one manufacturer’s damper may be used.
- If the specific assemblies are NOT specified, the available dynamically rated Ceiling Radiation Dampers cannot be substituted in another design unless it has been tested and approved by UL.
- The available design is limited in membrane penetration size (WxH) and rated velocity. Designers should be aware of limitations prior to specification.

Resources

- **AMCA International:** www.amca.org
- **AMCA Publication:** www.amca.org/store
 - > **503-08:** Fire, Ceiling (Radiation), Smoke and Fire/Smoke Dampers Application Manual (*Available for purchase*)
- **AMCA White Papers:** <https://www.amca.org/educate/#articles-and-technical-papers>
 - > Ceiling Dampers Explained, April 2018
- **Underwriters Laboratory:** <https://www.ul.com/>

Thank you for your time!

*To receive PDH credit for today's program, you **must** complete the online evaluation, which will be sent via email 1 hour after this webinar.*

PDH credits and participation certificates will be issued electronically within 30 days, once all attendance records are checked and online evaluations are received.

Attendees will receive an email at the address provided on your registration, listing the credit hours awarded and a link to a printable certificate of completion.

Questions?

To submit CRD-related code and/or standard questions which AMCA committees can respond to, email agunzner@amca.org. Please note that follow up to questions may take an extended amount of time but will be responded to.

NEXT PROGRAM

Join us for our next *AMCA insite* Webinar:

- Wednesday, July 21
- 12:00-1:00pm CDT
- ***TOPIC: U.S. Codes, Standards, and Regulations for Large Diameter Ceiling Fans***
- Presenters: Michael Ivanovich, Sr. Director Global Affairs, AMCA
Aaron Gunzner, Advocacy Manager, AMCA
Nazme Mohsina, Technical Director, AMCA
Christian Taber, Principal Engineer- Codes & Standards, AMCA Member Company

>> For additional webinar dates go to: www.amca.org/webinar