

# Acoustical Ceiling Lesson Plan

## Concept/principle to be demonstrated:

Acoustical or “suspended” ceilings are commonly used in commercial buildings, and must be designed to lay out ceiling sections equally. This lesson teaches students how to calculate for area based on specific dimensions. Understanding is demonstrated when students can solve a variety of construction-related problems.

## Lesson objectives/Evidence of Learning:

- Understands relationship of blueprints to acoustical ceiling layout
- Calculates the area and perimeter of rectangles for exact room specifications
- Evaluates the advantages and disadvantages of different strategies, representations, and tools for solving a problem
- Recognizes and justifies the need for an exact answer in a given situation
- Applies math to solve variety of construction problems
- Uses calculator to compute accurately

## How this math connects to construction jobs:

Balance and symmetry in a room is achieved by proper installation of components. This lesson will help students comprehend how a multi-step process is used to establish the number of full rows of tile and to determine border size from floor to ceiling.

- **Acoustical ceiling installers** use a multi-step process to determine the rows of full tiles and maximum border tile size.
- **Tile setters** install full tiles after determining the size of the border tiles.
- **Installers of pedestal floors** for computer wiring access make the largest border possible and full tiles needed to properly support all weight put on the floor.
- **Carpet layers** ensure balanced borders for inlays and intricate floor patterns by using similar layout processes.

## Teacher used training aids:

- 4'x2' ceiling tile, pieces of wall angle, main runners and cross tee

## Materials needed per student:

- Pencil
- Calculator with  $\sqrt{\quad}$  key & memory +/- functions
- *Acoustical Ceiling Worksheet*

## Terms:

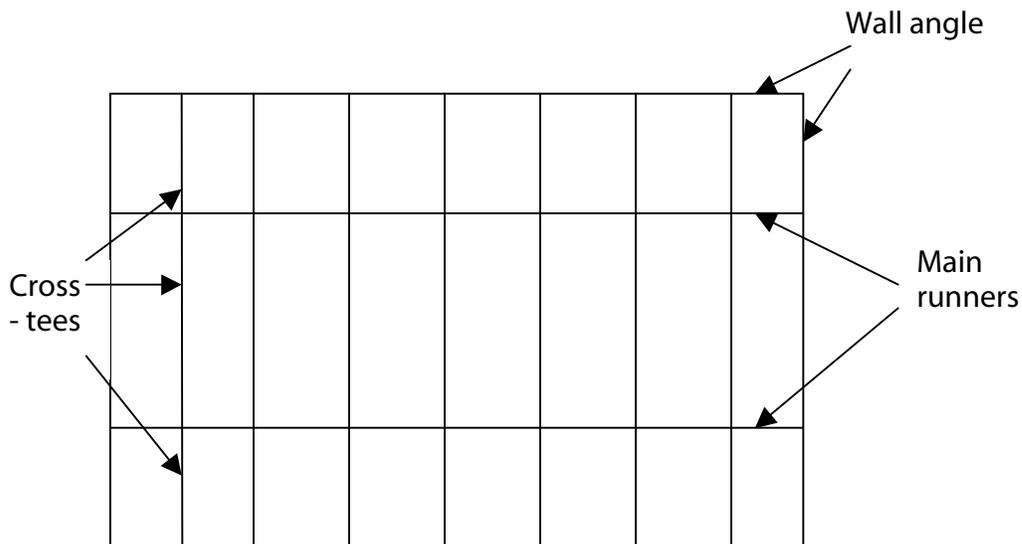
- **Main Runners:** Are shaped like an upside down T and come in 12' lengths. They extend from wall to wall and are the primary ceiling support. End splices allow for greater lengths. Slots 12" apart along the runner side allow cross tee to connect.
- **Cross tees:** available in 2' and 4' lengths. They connect between main tees using interlocking tabs.
- **Wall angle:** L-shaped pieces that fasten to the wall and support the ends of the main runners and cross tees.
- **Ceiling panels:** Are available in a variety of materials, surface finishes and designs.
- **Border:** Cut panels around the perimeter of the room. They should be greater than half of a tile to maintain balance and add visual appeal.

## Lesson Introduction:

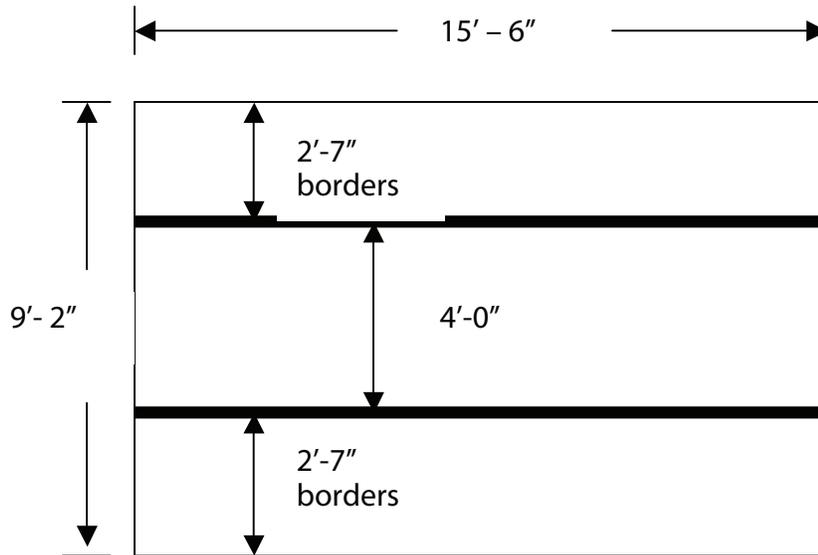
Suspended ceilings are widely used in commercial buildings. They provide space for lighting, pipes and ducts. A suspended ceiling also conserves energy by increasing the insulating value of the ceiling. Not only does the suspended ceiling cover pipes and ducts, the removable panels allow access to these items as well.

## Lesson Components:

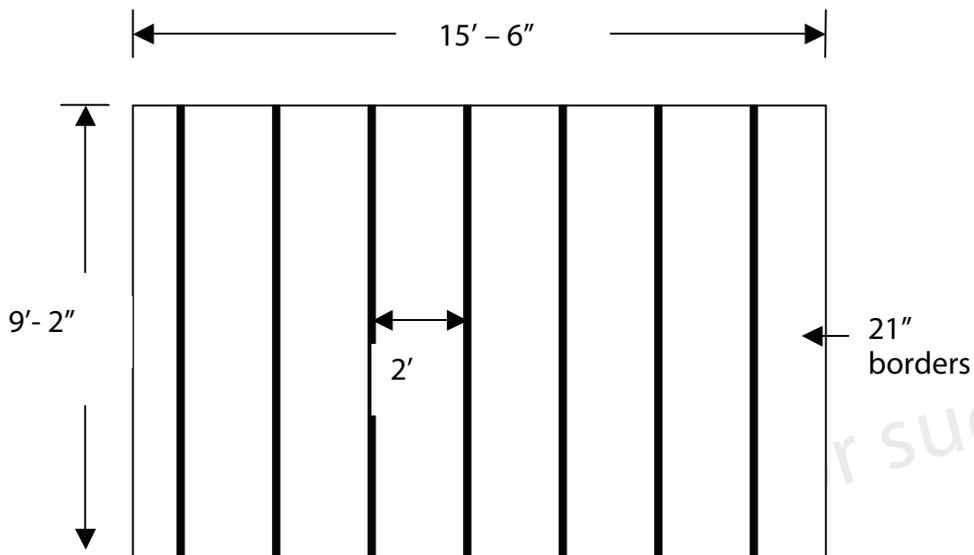
1. Typically, suspended ceiling panels are 2' by 2' or 2' by 4'. These panels are supported by a metal grid. The grid consisted of main runners and cross tees that rest on wall angles. The grid is suspended from hanger wires.
2. Draw on white board and explain the following components



3. The height of the ceiling is provided from the working drawings or blueprints. Any of several leveling devices is used to establish a level mark around the room at the top of the wall angle (this prevents any marks from showing once the ceiling is installed).
4. The installer must layout the ceiling and determines the length and location of the main runners. Typically the main runners span the length (long wall) of the room.
5. Math: divide the room size (feet only) by the tile size. In this case we are using 4' x 2' tile.  $9' \div 4 = 2$  rows of main runners. Two rows equal a 4' space.



6. The remaining 5'-2" or 62". The border size is  $62" \div 2 = 31"$  or 2'-7"
7. Math: divide the 15'-6" wall by 2'.  $15 \div 2 = 7$  rows of cross tees with 3'-6" remaining.



8. Remaining  $3' - 6" = 42" \div 2 = 21"$  borders.
9. Hand out calculators and *Acoustical Ceiling Worksheet*, and encourage students to work in teams.

# Acoustical Ceiling Worksheet

Using the rooms dimensions below, complete the following table for 4' by 2' ceiling tiles:



Room size	Rows of mains	Main border	Cross tee border
1. 16'-2" x 19'-2"			
2. 52'-7' x 67'-3"			
3. 95'-4" x 113'-1"			
4. 35'-8" x 71'-4 1/2"			



## Acoustical Ceiling Worksheet

Using the rooms dimensions below, complete the following table for 4'by2' ceiling tiles:



Room size	Rows of mains	Main border	Cross tee border
1. 16'-2" x 19'-2"	4	25"	19"
2. 52'-7' x 67'-3"	13	27 1/2"	19 1/2"
3. 95'-4" x 113'-1"	23	20"	18 1/2"
4. 35'-8" x 71'-4 1/2"	8	22"	20 1/2"

