Module 3 **SERVICE BRAKE CHAMBERS, SLACK ADJUSTERS AND FOUNDATION BRAKES (WHEEL BRAKES)**

Subject: **Service Brake Chambers – How they work**

Animation: **ABI-CE 3-1**

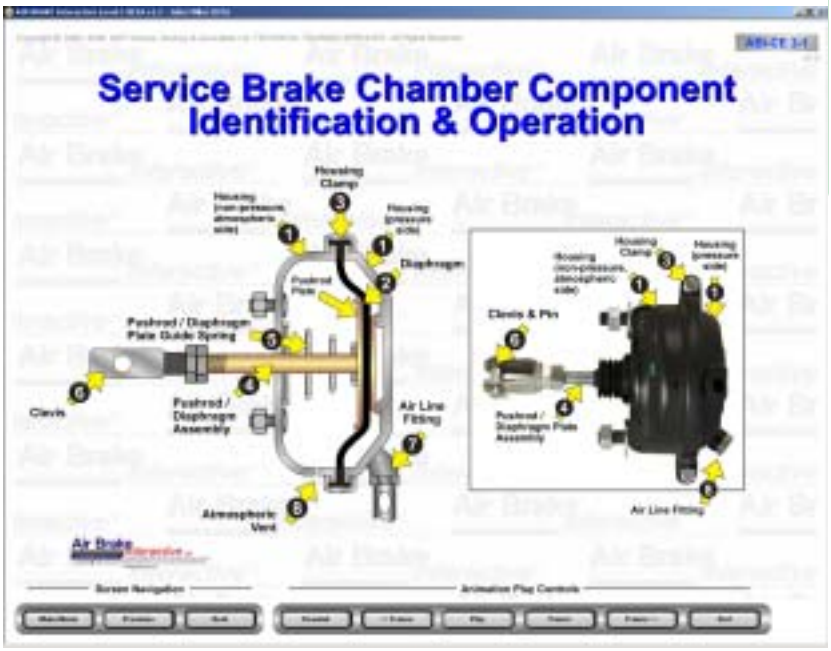
LEARNING OUTCOME Having successfully completed this section, students should be able to list and identify the principal components and explain the operation of a typical air service brake chamber.

Presentation 10 minutes
Animation 0 min. 41 sec.

1. In an air brake service brake system, it is the service brake chambers that convert the stored energy of compressed air into the mechanical force required to apply the wheel brakes.
2. The principal components of a typical service brake chamber are:
   1) a 2-piece housing – consisting of the pressure and atmospheric sides of the chamber
   2) a flexible diaphragm which separates and seals the 2 halves of the chamber
   3) a housing clamp, which secures both halves of the chamber together
   4) a pushrod and diaphragm plate assembly (against which the diaphragm pushes)
   5) a pushrod / diaphragm plate guide spring
   6) a clevis and clevis pin, used to attach the pushrod to the wheel brake linkage (slack adjuster)
   7) an air fitting which is connected to the service brake air line leading to the chamber
   8) an atmospheric vent
3. The diaphragm seals and divides the brake chamber housing into two chambers.
4. One side of the chamber (the non-pressure side) is open to atmosphere (point out vent hole).
5. The other side of the chamber (the pressure side) is connected to the service brake circuit.
6. RUN ANIMATION.

ABI-CE 3-1 Service Brake Chamber Animation Dialogue

In static mode, with no air pressure applied, the pushrod and diaphragm plate assembly is in its fully retracted position. When air pressure is applied to the pressure side of the chamber, it acts against the pushrod plate and diaphragm assembly. This forces the pushrod outward, which applies the wheel brakes. When the driver releases the brakes, the air pressure inside the brake chamber is vented to atmosphere. The pushrod guide spring, aided by the brake shoe return springs in the wheel brake, returns the pushrod / diaphragm plate assembly to its static position, and the wheel brake releases.



Recommended Training Support Components

- Various Service Brake Chamber Assemblies
- Cutaway Service Brake Chamber

ABI-CE 3-1

QUICK-REFERENCE NOTES

Use this page to record your personal presentation notes for the preceding page material.

Instructor's
DOODLE BOX

Module 3 SERVICE BRAKE CHAMBERS, SLACK ADJUSTERS AND FOUNDATION BRAKES (WHEEL BRAKES)

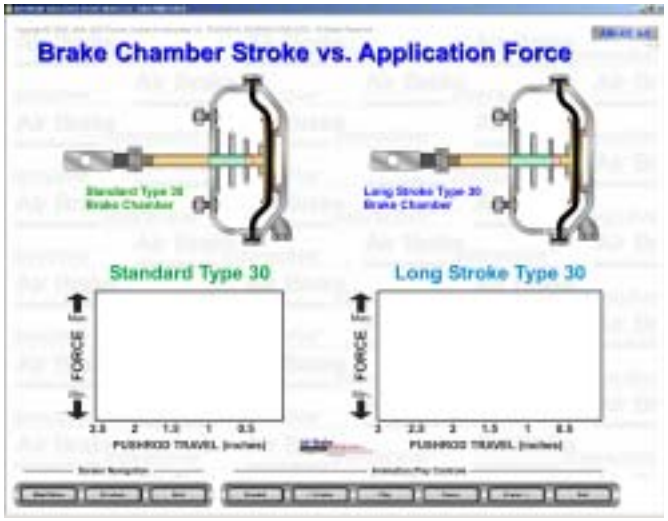
Subject: Brake Chamber Stroke vs. Application Force

Animation: ABI-CE 3-5

LEARNING OUTCOME Having successfully completed this section, students should be able to describe and discuss 'Effective Stroke', 'Over Stroke' and explain how pushrod force is influenced by excessive brake chamber stroke.

Presentation 8 minutes
Animation 2 min. 27 sec.

1. The amount of force generated by a brake chamber varies not only with brake chamber size and applied pressure but also over the length of the stroke.
2. A brake chamber's total stroke can be divided into 2 sections, '**Effective Stroke'** and **'Over Stroke'**.
3. **Effective Stroke** is the real working portion of the stroke, where the chamber is capable of developing its maximum effective force.
4. **Over Stroke** is the small remaining portion of the stroke, beyond the effective stroke, at the end of which the diaphragm plate and pushrod assembly will bottom out against the chamber housing, and force will immediately drop to zero.
5. For the purpose of explaining brake chamber stroke, we will consider **Effective Stroke** to be the same as the **Adjustment Limit** listed in the previous Brake Chamber Stroke Chart.
6. A Standard Type 30 chamber (30 sq. in. effective pressure area) has a total stroke of 2 1/2 inches, but the Effective Stroke or Adjustment Limit range (the stroke distance over which the chamber is capable of generating maximum force), is only 2 inches.
7. A Long Stroke Type 30 chamber's total stroke is approximately 3", of which only 2 ½" is Effective Stroke or its Adjustment Limit range.
8. **Free Stroke** is the free movement of the pushrod before the brake shoes actually engage the drum.
9. The Free Stroke movement takes up mechanical slack in the wheel brake components as well as the normal clearance between the brake shoes and drum (when the brakes are disengaged and the brake shoes are retracted).
10. Free Stroke is part of a brake chamber's effective stroke range. So, the more slack or mechanical play there is in the wheel brake components (due to wear or excessive brake shoe-to-drum clearance), the more of the Effective Stroke is consumed as Free Stroke – and the less Effective Stroke or Adjustment range will remain for effective brake operation.
11. In a Type 30 chamber, 2" is the **MAXIMUM** Effective Stroke and Adjustment Limit – **NOT** the recommended stroke!
12. In a Type 30 Long Stroke chamber, 2 ½" is the **MAXIMUM** Effective Stroke and adjustment limit – **NOT** the recommended stroke!
13. RUN ANIMATION.



IMPORTANT NOTE:

The Green Effective Stroke and Red Over Stroke indicators on the pushrods in this animation are not markings that would normally be found on actual brake chambers. They are included here only to enhance student comprehension of the concept of brake chamber stroke.

NOTE: See next page for animation dialogue

ABI-CE 3-5

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Module 3 SERVICE BRAKE CHAMBERS, SLACK ADJUSTERS AND FOUNDATION BRAKES (WHEEL BRAKES)

Subject: Brake Chamber Stroke vs. Application Force

Animation: ABI-CE 3-5 *(continued)*

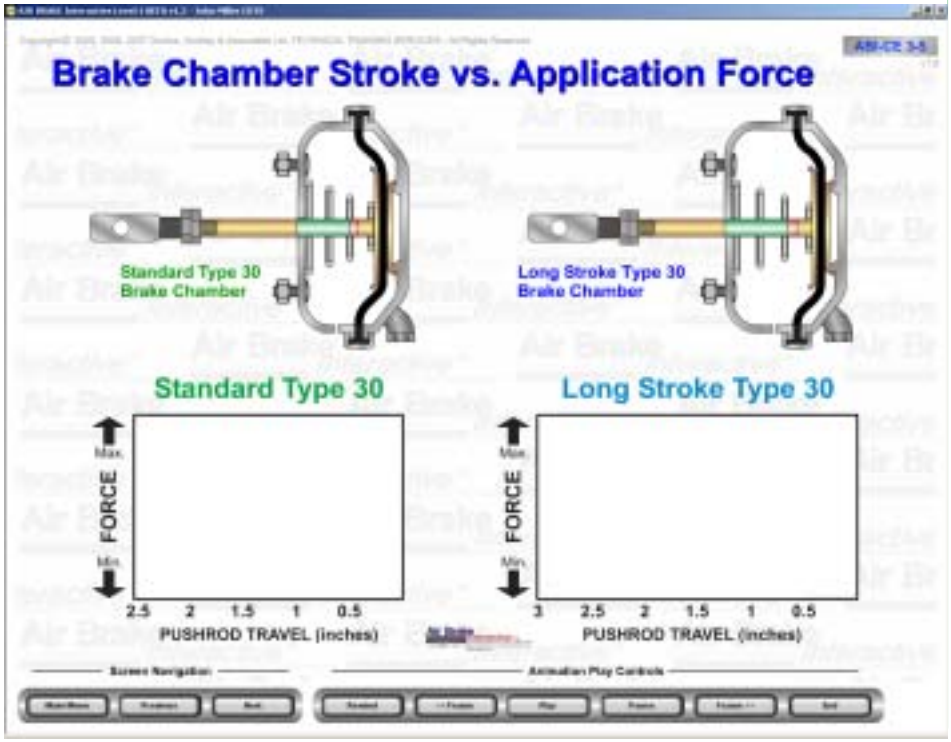
ABI-CE 3-5 Brake Chamber Stroke vs. Application Force Animation Dialogue

Each brake chamber size or type has a different and limited effective stroke. In other words, the length of the stroke, or the distance over which the pushrod and diaphragm plate can move and still produce force, is specific and finite. A brake chamber's over-all travel can be divided into 2 sections - Effective Stroke and Over-stroke. The two brake chambers depicted here are both Type 30 chambers. One is a standard Type 30 chamber, with an Effective Stroke or Adjustment Limit of 2". The other is a Long Stroke Type 30 chamber, with an Effective Stroke or Adjustment Limit of 2 ½".

When air pressure is applied to the brake chamber, it first moves the diaphragm plate and pushrod to take up the clearance between the brake shoes and drum and additional slack resulting from mechanical wear of the foundation brake components. This portion of the stroke is called Free Stroke and, as you can see, it consumes a certain portion of the brake chamber's Effective Stroke or Adjustment Limit range.

Once the brake shoes contact the brake drum, and all other mechanical slack has been overcome, the force generated by the brake chamber and applied to the wheel brake quickly increases. Where this occurs in the stroke depends on how much stroke is consumed in taking up the wheel brake's mechanical play and the gap between the brake shoes and drum. A brake chamber is able, however, to apply full and effective braking force throughout its entire effective stroke range, as illustrated here.

When improper brake adjustment and/or excessive mechanical wear allows the stroke to extend beyond its Effective Stroke or Adjustment Limit, the chamber enters the Over Stroke range. While, at this point, there is still some reserve stroke remaining, brake chamber output begins to drop off, and the chamber is dangerously near bottoming out. If and when the chamber does bottom out (where the diaphragm plate actually hits the brake chamber housing), brake chamber output force will drop to zero. At this point, there is no longer any application force being applied to the wheel brakes, which means the vehicle has no brakes.



ABI-CE 3-5 *(continued)*

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