# Making It Visual: Flexible Endoscope Inspection

## Henry Ford Health System's Posters, Scope Course Aid Technician Success

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### Abstract

The need for visual inspection has been discussed in the literature. The Association of periOperative Registered Nurses (AORN) provides a suggested list of what should be looked at during a visual inspection: cleanliness, missing parts, clarity of lenses, integrity of seals and gaskets, moisture, physical or chemical damage, and function. This is a good list, but endoscope technicians still need details on how this should look. They need a reference document at their fingertips to provide direction. Visual inspection guide sheets that clearly show what is normal and what needs attention, and that list actions to be taken, are essential for staff to be able to complete a thorough visual inspection.


### The Issue

Visual inspection of a flexible endoscope is a required step in the processing continuum, Unfortunately, it is a step that is frequently missed. Patient harm resulting from damaged and/or dirty endoscopes has been well documented.[1-4] Guidance documents reference the need for visual inspection, stating that endoscopes should be visually inspected to ensure they are clean and free of defects. Visual inspection is listed as a separate step and it is suggested that lighted magnification may be needed.[5-9] But what is a defect and what does a defect look like? How does "clean" look to the naked eye or under magnification? This lack of clarity creates confusion and leaves staff without the proper guidance to complete this vital task.

To bridge this gap, we worked with the Clinical Engineering department and our endoscope repair vendor to create a visual inspection poster that was incorporated into a four-hour endoscope course. This course covered point-of-use treatment, leak testing, care and handling, and visual inspection. The pictures used in the poster were all taken across our health system, unstaged, showing areas of opportunity within our endoscope processing departments. One of the images looked (with magnification) across the distal end at a clogged air/water cleaning valve. Staff quickly noticed that there was "something sticking up" and guessed that the endoscope was broken. It was explained that what they were seeing was normal endoscope anatomy, under magnification, and that the purpose of the air/water valve was to clear the lens, so the proceduralist could see (similar to wipers on a windshield). There were several images of glue bands, including greyed glue bands, cracked glue bands and missing glue bands. Each image was thoroughly discussed; staff members asked why we took the picture and what we were hoping they would learn from it.

After the first 18 months of the course, a marked improvement in staff members' ability to identify endoscope leaks was noted. The improvement in leak testing led us to believe that our educational method was successful; however the staff were still struggling with visual inspection of the endoscopes.

When completing endoscope processing audits, staff were questioned about visual inspection. Their response was that it was difficult to remember all the details of visual inspection, as well as what should be looked at as needing immediate repair versus what should be watched closely and, possibly, scheduled for repair.

To address this, two visual inspection posters were created. These posters were designed to be printed on infection control (wipeable) paper. This allowed the posters to be hung in the visual inspection area, so staff members could reference the pictures while they were doing visual inspections. The first picture on each of the posters is of a new endoscope and it explains what a new endoscope looks like (for example, new glue bands are black and shiny). Then the poster continues with detailed images of common damage/wear issues that should be identified through visual inspection. Next to the pictures is a description of what is shown, common causes and which action(s) should be taken. Each visual inspection poster is

## KNOW YOUR BANDS

This title may bring globally iconic bands to mind, such as The Beatles, Queen and The Rolling Stones. Although they greatly influenced our culture, it is important to discuss the underappreciated bands that hold the most fragile section of our endoscopes together — glue bands.

### What are glue bands?

Glue bands are the small, shiny black bands that hold the bending section tube onto the far end of the insertion tube on every flexible endoscope. They create a watertight seal that protects the internal components from fluid invasion. Every time an endoscope is used, the glue bands are exposed to substances like body fluids and harsh chemicals that cause wear and tear.

### What to look for?

Knowing what to look for and when to get them replaced helps to prevent patient injury, costly repairs and disease transmission.

### Visual inspections

During visual inspection, technicians should look for:

- Cleanliness
- Missing parts
- Clarity of lenses
- Integrity of seals and gaskets
- Moisture
- Physical or chemical damage
- Function

Knowing what is normal and what needs repairing is essential to properly evaluate an endoscope.

### Lighted magnification

Glue bands are one of the many components that should be inspected using lighted magnification after manually cleaning. A glue band may look fully intact when viewed, but magnification can prove otherwise.

The width of a glue band can range from 4.5mm-7mm. Finding an imperfection in a glue band, the size of this line: I would be nearly impossible without lighted magnification.

### Lifespan of the band

**New** - Glue bands on new or refurbished endoscopes are black, shiny and smooth. The smooth, well-sealed surfaces make the glue bands easy to clean.

**Worn** - As glue bands age, they become dull and begin to turn grey. This change is primarily a reaction to the chemicals used in the disinfection process. While this is a normal part of the band aging, it needs to be observed closely for signs of excessive wear.

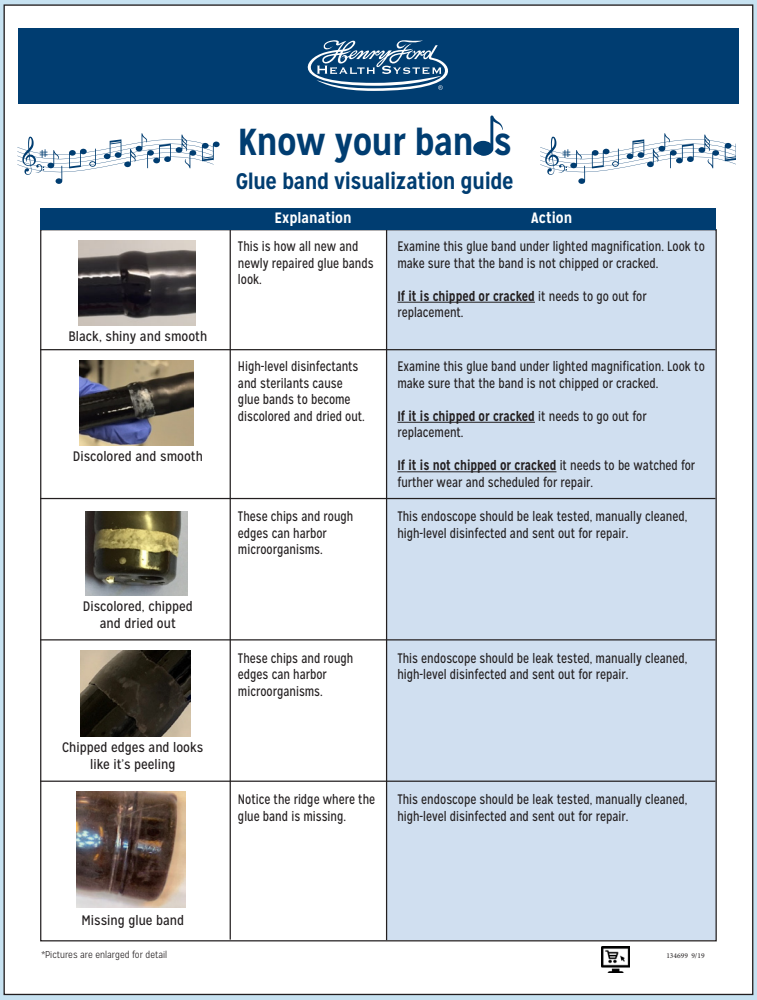
**Dry, Chipped and Cracked** - Signs of excessive wear include glue bands that look dried out, cracked or chipped.

**Dry** – Dried-out glue bands become rough, causing chips and cracks, which makes attachment points for microorganisms to adhere to their surface. They can also become brittle and break off.

**Chips and Cracks** - These are not just found in glue bands that show obvious signs of wear. Glue bands can lift around the edges or become chipped at any time. This makes it imperative that all glue bands are visually inspected every time.

The glue band visualization guide **(See Figure 1, above)** shows the progression of glue bands over time. To ensure the highest level of patient safety and prevent costly repairs, glue bands should be replaced at an early sign of wear.

**Source: Henry Ford Health System**



Henry Ford Health System

**Know your bands**

**Glue band visualization guide**

| | Explanation | Action |
|---|---|---|
| Black, shiny and smooth | This is how all new and newly repaired glue bands look. | Examine this glue band under lighted magnification. Look to make sure that the band is not chipped or cracked.<br><br>**If it is chipped or cracked** it needs to go out for replacement. |
| Discolored and smooth | High-level disinfectants and sterilants cause glue bands to become discolored and dried out. | Examine this glue band under lighted magnification. Look to make sure that the band is not chipped or cracked.<br><br>**If it is chipped or cracked** it needs to go out for replacement.<br><br>**If it is not chipped or cracked** it needs to be watched for further wear and scheduled for repair. |
| Discolored, chipped and dried out | These chips and rough edges can harbor microorganisms. | This endoscope should be leak tested, manually cleaned, high-level disinfected and sent out for repair. |
| Chipped edges and looks like it's peeling | These chips and rough edges can harbor microorganisms. | This endoscope should be leak tested, manually cleaned, high-level disinfected and sent out for repair. |
| Missing glue band | Notice the ridge where the glue band is missing. | This endoscope should be leak tested, manually cleaned, high-level disinfected and sent out for repair. |

*Pictures are enlarged for detail

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**Figure 1**

## THROUGH THE MAGNIFYING GLASS

When performing visual inspections, it's critical to know what you see as you peer through the magnifying glass. Without thorough knowledge of endoscope anatomy, that which is normal may appear abnormal.

The pictures below show the basic anatomy. Endoscopes have 1-3 light guide lenses, and an additional suction channel for air, water or gas. More complex endoscopes have ultrasound tips, and elevator mechanisms that require specific attention.

The c-cover holds all the distal components and helps protect the CCD chip (AKA the brain) and the fiberoptic light strands. It may be black or white, depending on the type of endoscope.

Looking directly down at the distal end, the surface appears smooth.

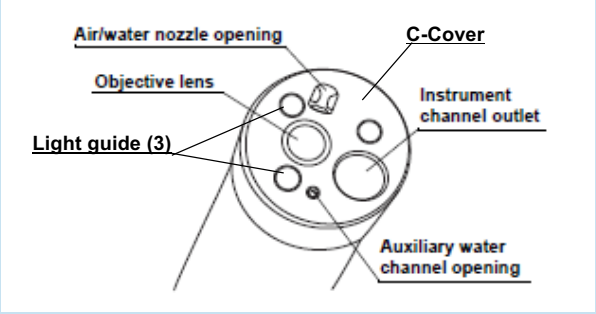



**Figure 2**

Looking across the distal end shows something very different. The air/water nozzle is raised to allow air and/or water to be sprayed across the objective lens. This functions much like the windshield washer on s car, allowing the proceduralist to see where they are directing the scope. Proper pre-cleaning, especially using the cleaning adaptor to flush the air water nozzle, is essential to prevent clogging of the air/water nozzle.

When visually inspecting the endoscope tip, staff should look directly down at the end and at a 45-degree angle in order to see all the surfaces. Staff should be looking for:

- Cracks in the lenses;
- Foggy lenses;
- Excessive scratches in the biopsy channel;
- Cracks or dents in the c-cover;
- Worn or pitted glue around the lenses and air/water nozzle;
- Clogged air/water nozzle; and/or
- Dirt or debris in the nozzle or on the surface.

The distal end visual inspection guide (above, right) provides details on what to look for and next steps.

**Source: Henry Ford Health System**

accompanied by a one-page narrative that offers further explanation of the topic. The narratives were written as a parody to engage interest, while providing valuable information.

Know Your Bands was the first poster released and it focused on glue bands. It begins by talking about iconic musical bands and transitions into a more technical article on glue bands. After its release, staff were able to describe the difference between a greyed glue band that needed replacing and a greyed glue band that needed watching. (See poster content on page 71.)

Through the Magnifying Glass was the second poster, written as a parody of *Through the Looking Glass* by Lewis Carroll. Just as Alice found everything in Wonderland backwards and confusing, looking through the magnifying glass at an endoscope can also be confusing. This poster focused on all the parts found in the distal end of an endoscope: lenses, lights, air/water nozzle, and the biopsy channel. (See poster content on page 72.)

## Conclusion

Visual inspection of endoscopes is a detailed process that needs to be treated with the same level of respect as a surgical time out.[9] It requires specialized tools, proper lightening, magnification, space, and reference materials. Staff members should have education specifically related to the normal and abnormal anatomy of an endoscope as well as all the details of visual inspection.

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