

# ESSENTIAL SELLING TOOLS

## Pop-A-Plug® Tube Plugging System

This document highlights what we consider to be our Essential Selling Tools for our Pop-A-Plug® Tube Plugging line. Each tool and/or document is summarized with the location of where they can be found and tips for usage! Primary documentation including our Corporate Capabilities brochure and Full Product Catalog remain our core selling literature and should be used in conjunction with the recommended tools herein to inform and excite customers.

1. Pop-A-Plug® Demo Equipment & Samples
2. Product Line Guide
3. Product Information Cards
4. Pop-A-Plug® P2 Installation Training Video & Animations
5. Application Sheets
6. Pop-A-Plug® vs. Friction Fit Tapered Plugs
7. ASME PCC-2 Article 312
8. EPRI Condenser Plug Selection Criteria
9. Smart Ram 640T
10. Quick Links

### 1. Pop-A-Plug® Demo Equipment & Samples



Pop-A-Plug® Demonstration Equipment and samples can be used during site visits where a live demonstration is needed, or in situations where samples would be useful to explain the benefits/features of Pop-A-Plug® Tube Plugs.

- Demonstration Kits
  - Heat Exchanger Tube Plugging and Testing
- Large HX Demo + Hydraulic Pump
- Cutaways
- Pop-A-Plug® Samples

These items can be requested through our Rep & Distributor Resource Center. If you do not have a login, please contact the Marketing Department ([EST-Marketing@curtisswright.com](mailto:EST-Marketing@curtisswright.com)).

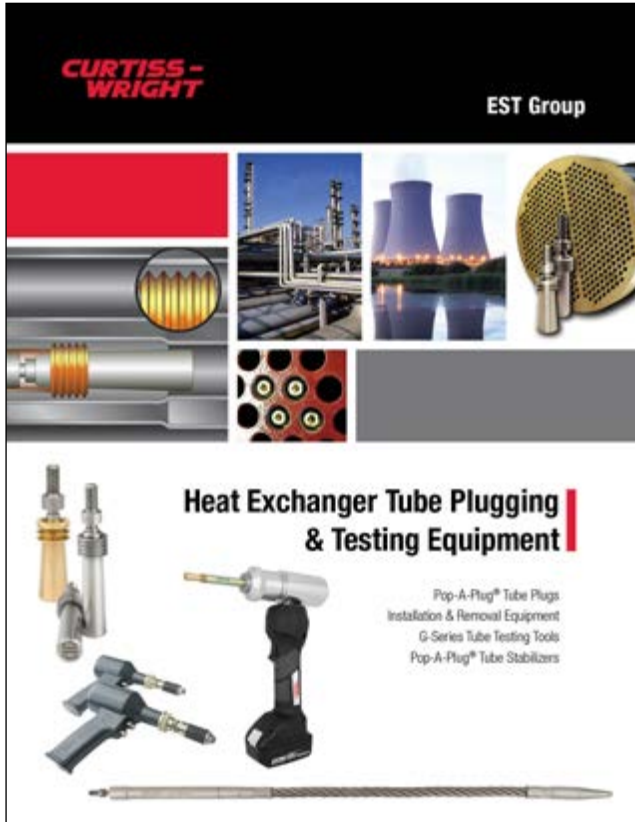
**Location:** [SalesHUB](#) | [Sales Tools](#)

#### Tip!

Pop-A-Plug® Demo Equipment and Product Samples can be brought to site visits where a live demonstration is needed or in situations where samples would be useful to show the functionality and benefits of our tube plugging solution.



## 2. Product Line Guide



The **Heat Exchanger Tube Plugging & Testing Equipment Product Line Guide** serves as a great companion piece to our Full Product Catalog. Perfect for customers who are only interested in Heat Exchanger Testing & Repair equipment. Contains detailed information on each product in this line.

**Document Includes:**

- Product Descriptions
- Test Pressures
- Size Ranges
- Standard Seal Materials
- Product Features

**Location:** [EST Group Website](#)

**Tip!**

Commercially printed copies are available by request through the Rep Resource Center or coordinate with your Area Sales Manager.



**Need a copy of this LINE GUIDE?**  
Scan the code to download.



**Need the FULL EST GROUP  
PRODUCT BROCHURE?**  
Scan the code to download.

### 3. Product Information Cards

**Pop-A-Plug® CPI/Perma Medium Pressure Tube Plugs**

**Solution Overview**  
The CPI/Perma Pop-A-Plug is the premier engineered mechanical tube plug, meeting off-the-shelf and non-tube in heat exchangers, condensers, feed water heaters, boilers, and other heat transfer units. Preferred by refineries, chemical plants, fertilizer plants, nuclear and conventional power plants around the world.

**Features**

- 1,000 PSI (68 BarG) rating with its safety factor
- Three points of sealing contact
- Manufactured in over 40 different materials

**Advantages**

- Breakaway design prevents damage to tubes and tube joints
- Controlled installation, no damage to customer
- Fast and efficient installation reduces unit downtime while increasing operating efficiency
- Does not require highly trained sub-contractors or technicians
- Same installation force, procedure, safety, every time
- Meets ASME, PCC-2 recommendations and EPRI criteria
- Lowest lifecycle cost compared to alternative methods
- Maintains helium leak tight seal of 1x10<sup>-6</sup> cc/hr

**Pop-A-Plug® Size**

- CPI/Perma: 1/4" to 1/2" (6.35 to 12.7 mm)
- Expansion Range: up to 1.287 (1.287 in.)

**Common Questions**

Q: What materials does it come in?  
A: CPI/Perma plugs are available in over 40 different materials.


Q: How many plugs come in a kit?  
A: 10 plugs per kit, also comes with Go/No-Go gauges, operating instructions, and a test certificate.

Q: Are they reusable?  
A: No, but they are removable. The CPI/Perma Pop-A-Plug is a permanent solution but can be removed with the use of the Pop-A-Plug Removal Tool (PRT). If a customer wants to retain a tube later.

Q: Will the Pop-A-Plug damage the tube or tube sheet that it's plugging?  
A: No, the Pop-A-Plug can be installed and removed without damaging your tubes or tube sheet joints.

**Cross-sell / Up-sell Opportunity**

- P2 Pop-A-Plug for higher pressure equipment
- Pop-A-Plug Tube Sealants
- G-160 Tube Tappers
- Installation Tools:
  - Small Run-In Tool
  - PAF/MSB
  - PAF/MSB
  - Close Quarter Run



**Product Information Cards** have been recently developed and are a great tool to learn about the core product offerings of the Curtiss-Wright EST Group. These cards are perfect for learning the basics of new products, or a quick refresher on a technical detail before you talk to a customer.

The Product Information Cards are split into two main segments for ease of use – Heat Exchanger segment, and Pressure Test and Isolation segment. Whether you're looking to brush up on your elevator pitch for a specific product, or can't remember exactly what sizes are offered as standard, the Product Information Cards are the ideal resource!

**Location:** [SalesHUB | Training Material](#)

**Tip!**

Keep these card decks handy to quickly brush up on product details and capabilities. Each card includes Product Overview, Features, Advantages, Size Ranges, Common Questions, Cross-sell / Upsell Opportunities.

### 4. Pop-A-Plug® P2 Installation Training Videos & Animations



The **Pop-A-Plug® P2 Installation Training Video** is a comprehensive step-by-step guide for tube plug installation that serves as a visual aid.

This video covers three main sections:

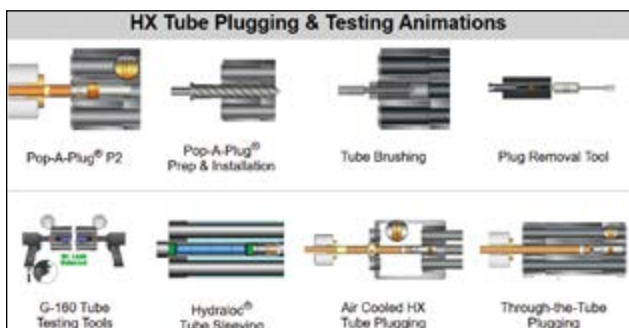
1. Tube Sizing and Inspection
2. Tube I.D. Preparation
3. Plug Installation
4. Plug Removal

The video highlights precautions to take when inspecting heat exchanger tube conditions, calculating the inner diameter of the tube and the importance of proper material selection. Preparation and installation tools are identified and correct assembly/proper use of the tools are covered. The video also touches on common issues and troubleshooting techniques.

**Location:** [EST Group Website](#)

**Tip!**

Videos & Animations are a great way to tell a story through a visual representation. This content is best used as an introductory visual aid for new and existing customers who have questions regarding the functionality of our product line. Animations can be easily attached to email communications and brought along during site visits to raise interest.



# CURTISS- WRIGHT

## EST Group Application Sheet

### Effective Heat Exchanger Tube Plugging for Highly Corrosive Environments & Processes

#### Plant Types

- Fertilizer
- Nitrogen
- Phosphoric Acid
- Potassium
- Ammonia
- Urea
- Acid
- Nitric
- Sulfuric

#### Key Personnel

- Maintenance Managers
- Reliability Engineers  
(Fixed Equipment)
- Turnaround Planners
- Inspection Supervisors

#### Applications

- Waste Heat Boilers
- Shell & Tube Heat Exchangers
- Refineries
- Condensers
- Air Cooled Heat Exchangers

#### Protect Your Waste Heat Boiler Assets

In high pressure service, welded plugs are prone to leaking due to stress cracking. EST Group engineers and manufacturers Pop-A-Plug Tube Plugs, a **proven performer** in highly corrosive and severe service conditions existing in Ammonia, Urea, and Purified Isophthalic Acid (PIA) processes and in their associated acid plants.

In conventional ammonia production processes Waste Heat Boilers (WHB) are the key component. When Waste Heat Boilers are shut down to shut leaks, the entire plant is shut down directly impacting production and revenue. Due to WHB operating temperatures and pressures, welded tube plugs are widely used. The welding process is difficult and often requires in-work lengthy periods of pre-heat and post weld heat treatment (PWHT) can often push repair times into days. **Pop-A-Plug Tube Plugs eliminate welding** and the time consuming pre-heat and PWHT cycles associated with it. Pop-A-Plug Tube Plugs can leave the plant back on line in hours – possibly inspecting the bottom line.

Figure 1: Fertilizer – Synthesis-Ammonia Production Process

#### Pop-A-Plug Tube Plugging System - Stats & Features

**Pressure Rating** up to 7000/psi (483 Bar) - Higher pressure available upon request

**Size Range** 400" to 1.440" (10.16mm - 37.08mm) Tube I.D. - P2 Plug  
 477" to 1.062" (11.96mm - 52.09mm) Tube I.D. - SW Plug  
 Larger/smaller sizes available upon request

**Available Materials** ASTM A-182 F46 (1.4F22); Zirconium, Carbon Steel, Inconel, Titanium, 316/316L Stainless Steel, Duplex Stainless Steel, Super Duplex Stainless Steel, Hastelloy Alloys, and Titanium; among other metal alloys commonly used in highly corrosive environments

#### Features

- Eliminates need for welding and time consuming pre-heat and PWHT
- Plug material matches tube material - mitigates thermal expansion, contraction issues and undesirable plastic deformation
- Helium leak tight seal
- Lowest life-cycle cost compared to alternative tube plugging methods
- Hydraulic installation significantly reduces turnaround/downtime
- Inexpensive solution - installed without need for hot welding tube, submerge and hydrogen damage
- Each plug is marked with ID number making it fully traceable in regards to material or configuration

- Describes challenges of using weld repairs in highly corrosive markets and critical importance of functioning waste heat boilers (WHB) to maintain optimal revenue and production schedules.
- Highlights key features and benefits of Pop-A-Plug Tube Plugs for highly corrosive environments and discusses the disadvantages of using welded-in tube plugs, and a diagram illustrating the function of a WHB for reference.
- This Application Sheet also contains two success stories to promote Pop-A-Plug Tube Plugs as an industry accepted solution for the fertilizer market.

- Plant Types
- Key Personnel to target
- Application Types

### Tip!

Application sheets are meant for customers with specific issues within the proposed application and are a great conversation starter. Utilize the plant type and key personnel to get in touch with the right contacts. Our business development team is here to offer assistance with our IRR database (Industrial Info Resources).

# Curtiss- Wright

## EST Group

[www.cw-estgroup.com](http://www.cw-estgroup.com)

# Don't Compromise Onsite Safety & Reliability by Using Friction Fit Tapered Plugs

## Pop-A-Plug® Tube Plugs - ASME PCC-2 Compliant Mechanical Plugging Method

Friction fit tapered plugs can be expelled during short side pressure testing or from tubes that have not been properly vented prior to plugging, potentially resulting in serious safety concerns for surmounting personnel and equipment. Pop-A-Plug Tube Plugs from EST Group offer a mechanical plugging solution for leaking and/or degraded heat exchangers, condensers and boiler tubes.

### Friction Fit Tapered Plugs Risks & Dangers

- Do not conform to ASME PCC-2 recommended tube plugging repair methods in applications above 200 Psig (14 BarG) / 400°F (205°C)
- Lack of pressure rating reduces on-site safety factor
- Can eject when system is pressurized and become a lethal projectile
- Can overstress and/or damage tube joints and crack tubeheads due to uncontrolled installation force
- Can damage expensive epoxy sealed tubeheads resulting in costly repairs
- May require welding in higher pressure scenarios/applications
- Welded installations may make re-tubing extremely difficult and expensive

Unfilled contact with tube/tubehead

**Mechanical Plugs should be considered in situations where friction fit tapered plugs are not appropriate for the pressure and/or temperature of service or other mechanical/environmental conditions.\***

### Pop-A-Plug Tube Plug Advantages

- Conforms to ASME PCC-2 recommended tube plugging repair methods
- **Safe** - pressure rated up to 7000 PSIG (482 BarG) - tested to 1.5 safety ratio
- **Reliable** - provides a helium leak-tight seal
- **Cost-Effective** - permanent solution engineered for optimal performance throughout the life cycle of equipment
- **Efficient** - Simple hydraulic installation significantly reduces turnaround times
- Controlled and repeatable installation force protects surrounding tubes and adjacent ligaments from damage
- Accommodates through the tube plugging applications
- Plug and tube materials always matched to prevent galvanic interaction
- No welding required
- Full material traceability - all plugs laser etched with lot number
- Compliant with QA Systems including AWS N45.2, N46.1, 10 CFR 50 App. B and 10 CFR 21
- Manufactured in an ISO 9001:2015 registered facility

Multiple points of contact with tube/tubehead

Pop-A-Plug® 1/2" and 3/4"

\*Inspection and Repair of Shell and Tube Heat Exchangers, The American Society of Mechanical Engineers (ASME) PCC-2, Article 2(2)

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**Location:** EST Group Website

**Tip!**

Use this document in conjunction with ASME PCC-2 Article 312 to promote EST Group's Pop-A-Plug® Tube Plugging System over Friction Fit Tapered Plugs. Perfect for new customers not familiar with our plugging system and/or potential customers who are on the fence with a "we've always done it this way" mentality.



## 7. ASME PCC-2 Article 312



Written by the American Society of Mechanical Engineers, ASME PCC-2 (Article 312) – *Inspection and Repair of Shell and Tube Heat Exchangers* provides general recommendations and requirements for inspecting and repairing leaking heat exchanger tubes. Pages 165–176 summarize specific conditions where Friction Fit Tapered Plugs should NOT be used as a solution for plugging leaking tubes due to serious safety concerns.

Tapered Plugs have an increased risk for failure in the following conditions:

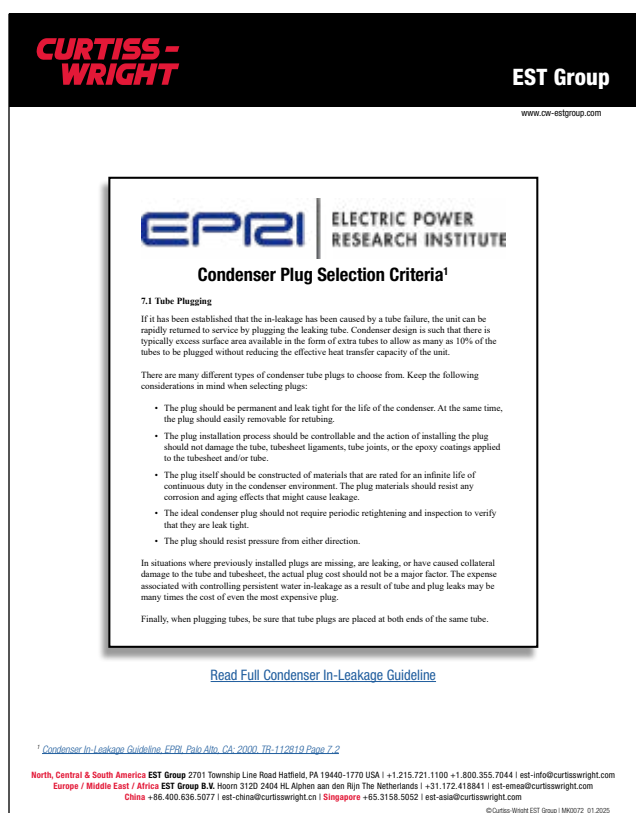
- (1) Shell-side operating pressure 1.5 MPa (200 PsiG) or more
- (2) Shell-side operating temperature 205°C (400°F) or more
- (3) Tube-to-tubesheet joints are welded or both welded and expanded

Location: [EST Group Website](#)

**Tip!**

Mechanical plugs should be considered in situations where hammer in tapered plugs are not appropriate for the pressure and/or temperature of service or other mechanical/environmental conditions. ASME PCC-2 should be referenced when a customers' process can be improved by following the above guidelines.

## 8. EPRI Condenser Plug Selection Criteria



Includes a summary of information compiled by Electric Power Research Institute (EPRI)<sup>1</sup> highlighting best practices and tactics for condenser plug selection. A guide where EST Group's Pop-A-Plug® Tube Plugs meet all considerations.

The EPRI guideline explains that tube plug cost should not be a deciding factor when looking at long-term effectiveness. Alternative tube plugs are a higher risk solution that can have adverse effects on a condenser, including plug ejection and/or leaks that cause collateral damage to the tube and tubesheet.


<sup>1</sup> Condenser In-Leakage Guideline, EPRI, Palo Alto, CA: 2000. TR-112819 Page 7-2.

Location: [EST Group Website](#)

**Tip!**

This document should be referenced for both minor condenser tube repairs and large scale condenser plug change out applications. Leverage this resource for plants new to plugging and plants using alternative methods.

## 9. Cordless Smart Ram 640T





**EST Group**  
www.cw-estgroup.com

### Battery-Operated Smart Ram 640T

**Install Pop-A-Plug® Tube Plugs with Ease!**

Quickly perform heat exchanger tube repairs without significant setup or breakdown time. Self-contained battery-operated hydraulic unit provides reliable installation of heat exchanger tube plugs. Long-lasting 18V/3.0Ah Lithium-ion battery allows for cordless operation in remote and close quarters environments without the need for electric or plant air connection.

**Size Range Capability**

- **Pop-A-Plug® CPI/Perma Plugs:** V471 thru V1212
- **Tube ID:** 0.472" to 1.336" (11.99 mm - 33.93 mm)
- **Pop-A-Plug® P2 Plugs:** P2400 thru P21160
- **Tube ID:** 0.400" to 1.180" (10.19 mm - 29.99 mm)

**Weight**

- 5lbs (2.3kg)

**Features**

- Ideal for remote or confined spaces
- Eliminates tripping hazards
- Self-contained unit - no shop air or electric required
- Long-lasting 3.0Ah Li-Ion Battery
- Install up to 500 tube plugs on fully charged battery
- Install with BAW or Pull-to-Pressure methods
- Info display with multi-user preset capabilities

For additional installation, sizing and Pull Rod Assembly information, please reference:

- [DC1230 - Smart Ram 640T Operating Procedures](#)

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Convenience Redefined - the Smart Ram 640T is battery-operated making it an easy-to-use tool when working on plugging heat exchanger with EST Group's Pop-A-Plug® CPI/Perma and P2 Tube Plugs.

1. Self-contained battery-operated unit
2. Only 5lbs (2.3kg)
3. Ideal for remote or confined spaces
4. No trip hazards associated with hydraulic lines
5. Info display with multi-user preset capabilities

**Location:** [EST Group Website](#)

**Tip!**

Customers who currently use electric or hydraulic-powered rams for plug installation may appreciate the ease of use this battery-operated tool offers. No wires or cords to trip over.

## 10. Quick Links

CURTISS - WRIGHT			EST Group
Quick Links Menu			
Type the # into the body of an email, then press the F2 key to insert link.			
Category	Document Title	Q&A Ref. #	
Product Videos	Grp Tight® Reverse Pressure Test Plug - Installation Video	200	
Product Animations	High Lift Hanger Weld Test Plug	276	
Product Videos	Installation Training - Pop-A-Plug® P2 Heat Exchanger Tube Plugging Syst	208	
Grp Tight® High Pressure Test Plug	100% Technical Specifications - JT Through 1" Sizes	8899	
Published Articles	A Saker Repair Solution for Critical Use Heat Exchangers - Pop-A-Plug® T	1301	
Product Animations	Air Cooled Heat Exchanger Tube Preparation - Drilling	206	
Product Animations	Air Cooled Heat Exchanger Tube Preparation - Plug Sizing - Go/No-Go G	206	
Product Animations	Air Cooled Heat Exchanger Tube Preparation - Reaming Weld Droop	204	
100% High Pressure Test Plug	Alternative Seal Material Operating Procedures	2893	
Grp Tight® High Pressure Test Plug	Auto-Grp Tight Test Plug Operating Procedures	9811	
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Product Videos	Cleaning and Storage - Grp Tight MAX® Test Plug	271	
Pop-A-Plug® CPI/Perma Tube Plug	Close Quarters Ram Installation Procedures	4607	
Pop-A-Plug® Installation & Removal Application Sheets	Close Quarters Ram Operating Procedures	891	
Translated Documentation - Spanish	Condensate Plug Change Out - Pop-A-Plug® Heat Exchanger Tube Plugging	4461	
Turnover Documentation	Condensate Plug Change Out - Pop-A-Plug® Heat Exchanger Tube Plugging	54901	
Translated Documentation - Spanish	Corporate Capabilities Brochure	064	
Grp Tight MAX® Test Plug	Corporate Capabilities Brochure	5504	
Published Articles	Cost Savings Test Plugs are Welded End Caps	1312	
Grp Tight MAX® Test Plug	Curtiss-Wright EST Group - Engineering Reliability for Extreme Service	2804	
Published Articles	Customer Testimonial - Reduce preparation time and loop readiness with G	1536	
G-250 Vacuum Tube Testing Tools	Delivering Speed and Safety to Pipe Weld Testing - Grp Tight® Isolation Pl	2402	
Published Articles	Dimensional Drawing	1802	
Product Animations	Double Block & Bleed Test / Isolation Plug - A Secure Isolation Solution fo	2825	
Pop-A-Plug® P2 Tube Plug	Double Block and Bleed Isolation Plug	217	
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Virtual Tradeshow Booth	EST Group Virtual Tradeshow Booth	2029	
Virtual Tradeshow Booths	EST Group Virtual Tradeshow Booths	2029	
Published Articles	EST Group's Custom Product Solutions Team - Optimizing Operations wit	2806	
Application Sheets	Fertilizer & Acid Markets - Pop-A-Plug® Heat Exchanger Tube Plugging Sys	4002	
Pop-A-Plug® P2 Tube Plug	Fertilizer Success Story - Pop-A-Plug® Heat Exchanger Tube Plugging Sys	506	
Product Animations	G-160 Tube Testing Tools	210	
Product Videos	G-160 Tube Testing Tools Demonstration Video	210	
Translated Documentation - Spanish	G-160 Tube Testing Tools User Guide	57808	
Product Animations	G-160 Tube Testing Tools with Diagrams	210	
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Product Animations	Grp Tight® Reverse Pressure Test Plug	215	
Application Sheets	Grp Tight® Test & Isolation Plugs for Flange Weld Connections	4004	
Application Sheets	Isolation Plug	4005	

Series of Microsoft Outlook shortcuts that can add product related links to an email. This is an efficient way to send product information without having to attach large files!

Compatible with Microsoft Outlook only.  
Step-by-step instructions are available.

**Location:** [SalesHUB | Quick Links](#)

**Tip!**

Quick Links are a great way to transmit product information to current or potential customers via email, without needing to attach large files. Especially useful when needing to send presentations and/or video files!