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# Colorado Voting System Certification and Verification

The Process from Application to Installation to Election

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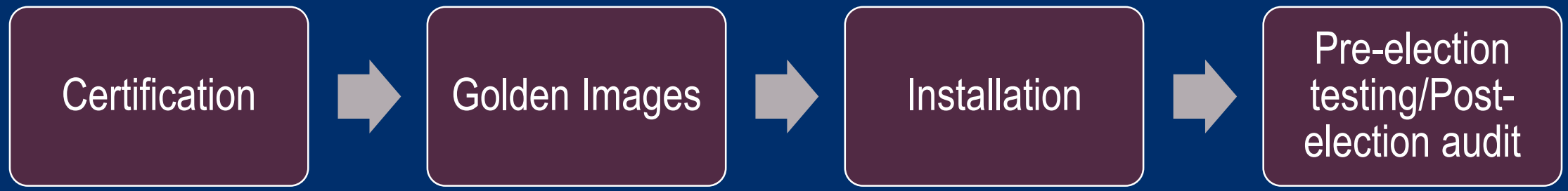
# The Timeline

These slides show the timeline of the voting system certification and installation process. The timeline below will accompany the information throughout the slides to show where in the process each step is. The steps and requirements in this are governed by Title 1, Articles 5 and 7 of the Colorado Revised Statutes and Election Rules 11, 20, and 21.



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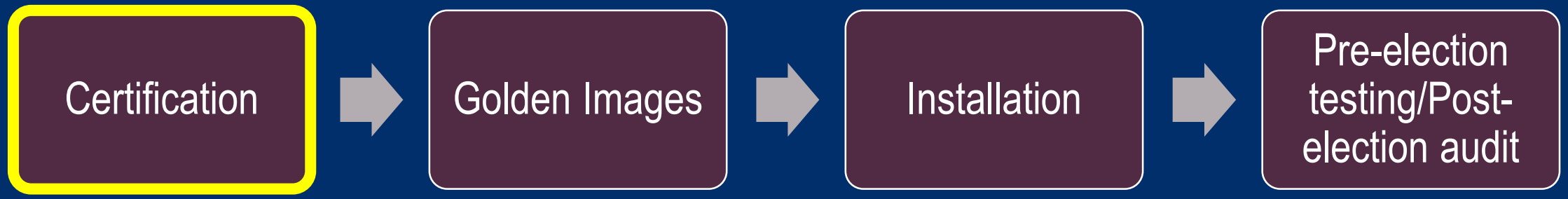
# Certification



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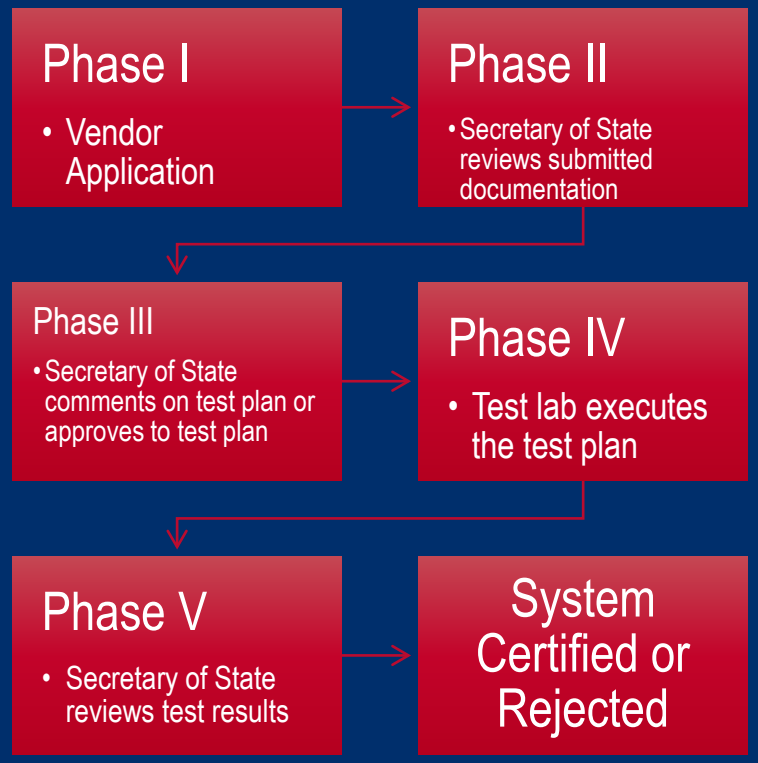
# Certification - Phases




The Certification Process is a five phase process that involves the Secretary of State, the voting system vendor, and a voting system test lab that is nationally accredited by the Election Assistance Commission (EAC).

The flowchart to the left shows a simplified version of the five phases.

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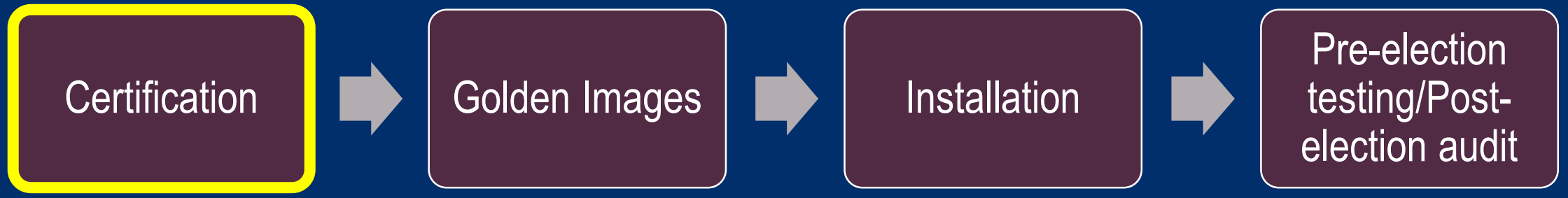
# Phase 1 - Application

The Certification Process formally begins when a voting system provider submits an Application for Certification to the Secretary of State. The application lists both software and hardware that is part of the voting system, including part and version numbers. The application will be updated throughout the certification process to reflect any changes that occur.

Additionally, the voting system provider and the Secretary of State arrange for a format and time for the provider to carryout a demonstration for the public to see and/or use the voting system under consideration.



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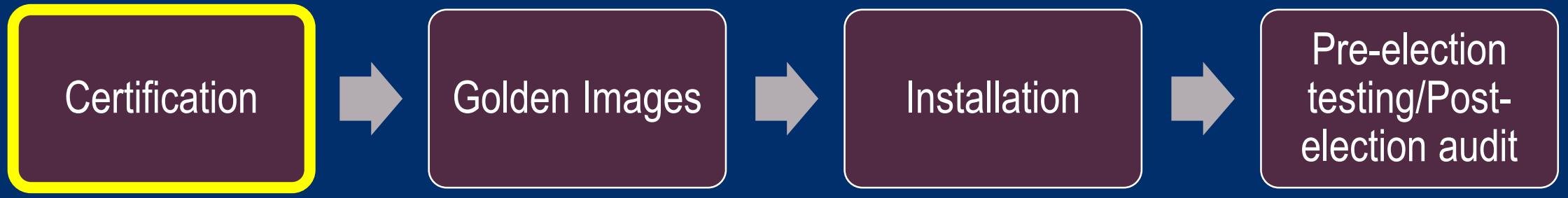
# Phase 2 – Document Review

In the application package the voting system provider also submits the technical data package, any test reports from testing for other jurisdictions and a preliminary requirements matrix. During Phase 2 the Secretary of State reviews these materials for compliance with requirements to determine what will be needed to be tested by the EAC accredited test lab.



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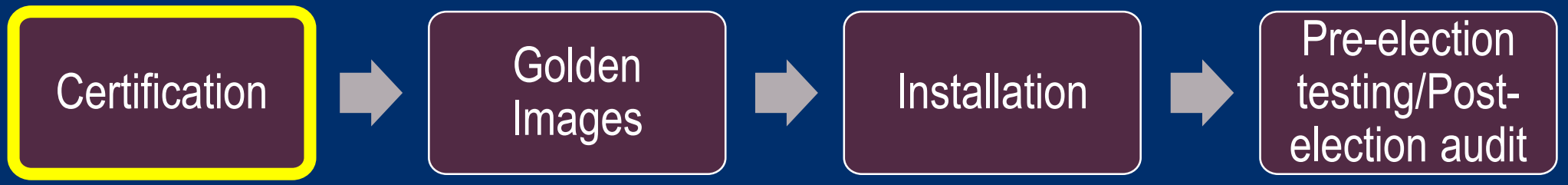
# Phase 3 – Test Plan

The voting system provider works with the EAC accredited test lab to draft a test plan for the voting system. The provider then submits the draft test plan to the Secretary of State. The Secretary of State uses the review of the materials from Phase 2 to determine if the plan is acceptable. Often times this phase can consist of many iterations of the test plan before it is determined to be acceptable for testing to begin.



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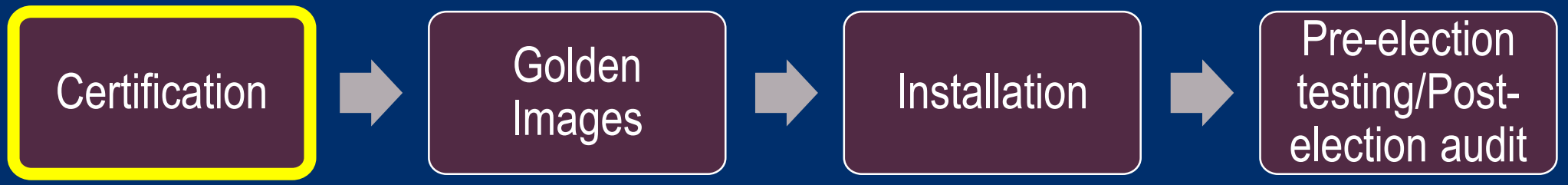
# Phase 4 - Testing

After the test plan is approved the test lab can commence testing. Throughout testing, if the test lab identifies deficiencies, the voting system provider can make slight modifications to the system to address the deficiencies. The provider makes updates to the technical data package to address any changes made during testing, or if the Secretary of State identified deficiencies in the documentation during the review.



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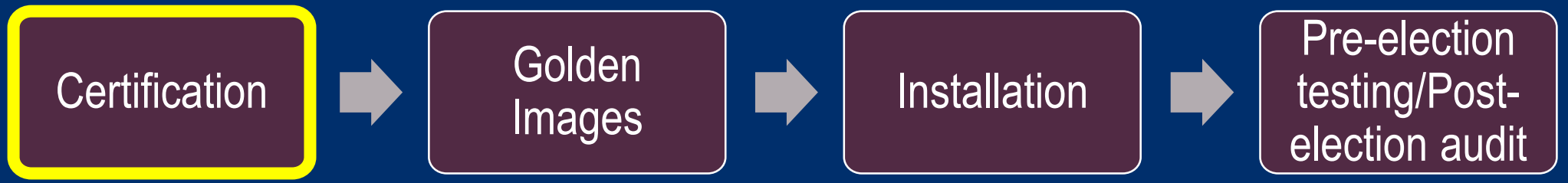
# Phase 5 – Compliance Review

After the completion of testing the Secretary of State reviews the test plan and completed final requirements matrix for compliance. For a voting system to be certified it needs to achieve substantial compliance. What this means is that if the system meets the major requirements and overall demonstrates that it complies with the intent of the law, the system is certified.



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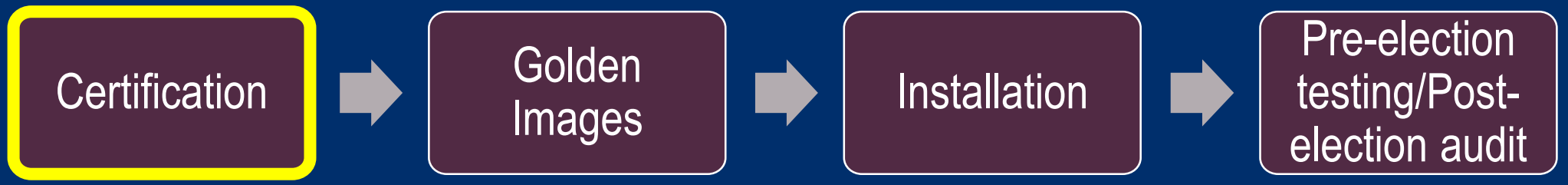
# Certification Determination

Once the determination of certification is made (or rejected) the Secretary of State has 30 days to post all of the documentation reviewed on the department's website. This includes the technical data package, user guides, test reports, and documents from other certification campaigns, if applicable. Some of the documentation is withheld from the public posting because of security or proprietary considerations. The documentation can be found on the Voting Systems page of the Secretary of State's website.



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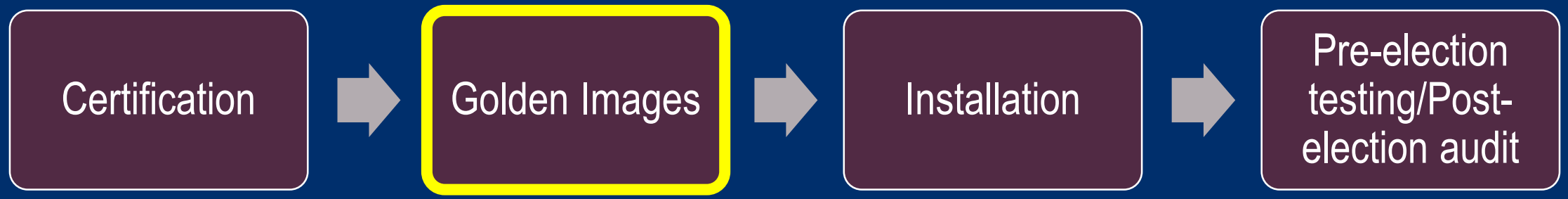
# Golden Images



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# What is a Golden Image?

A Golden Image is a copy of a computer's hard drive that can be placed directly onto the hard drive of another computer so that the new computer's content directly mirrors the original computer's content at the time the image was created.

The Secretary of State uses the Golden Image process for the Dominion Voting System's Democracy Suite voting system to make the installation process efficient, and to ensure that the same exact copy of the certified system is installed throughout the state.  Clear Ballot's ClearVote is not installed using a Golden Image process and instead is installed using the media sent directly by the test lab.

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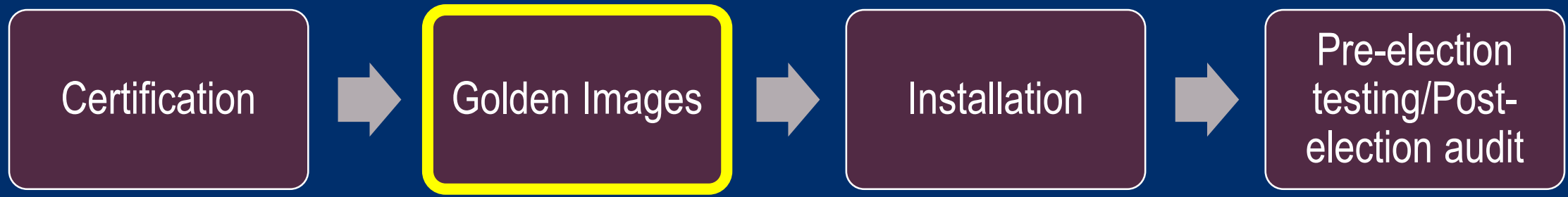
# Getting the Certified Software

After the Secretary of State certifies a voting system the certified version of the software is sent directly from the voting system test lab to the Secretary of State's office on write-once media (DVD-ROM) to ensure no changes can be made once it's placed on the media. The software does not come from the voting system provider. Separately, the test lab sends hash values for all of the certified applications so that the contents can be verified. This ensures the software being used in Colorado is the exact version of the software that was tested by the lab and certified by the Secretary of State.



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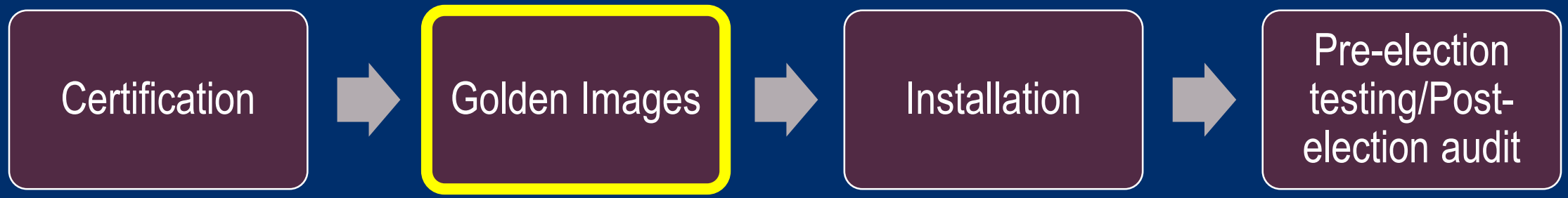
# Installing the Certified Software

Once the certified software is obtained by the Secretary of State, background-checked staff work directly with the voting system provider to install and configure the voting system software on components of the voting system. The components are completely fresh computers with no software installed, including an operating system. After the software is installed the hash values of the software are compared to the hash values sent by the voting system test lab.



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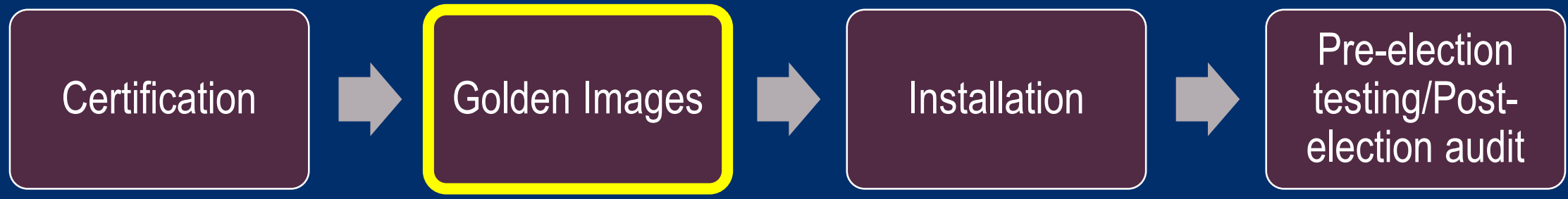
# Possession during creation of the Golden Images

The installation and configuration is a complex process and takes a number of days to accomplish across all of the components and among the different types of computers that will be used in the state. At no time is any part left outside of the possession of a Secretary of State Staff member, including meal breaks or overnight. At the end of each day interim images are created and chain of custody is ensured using sealed, secure cases. Then those interim images are restored in the morning so that work may recommence.



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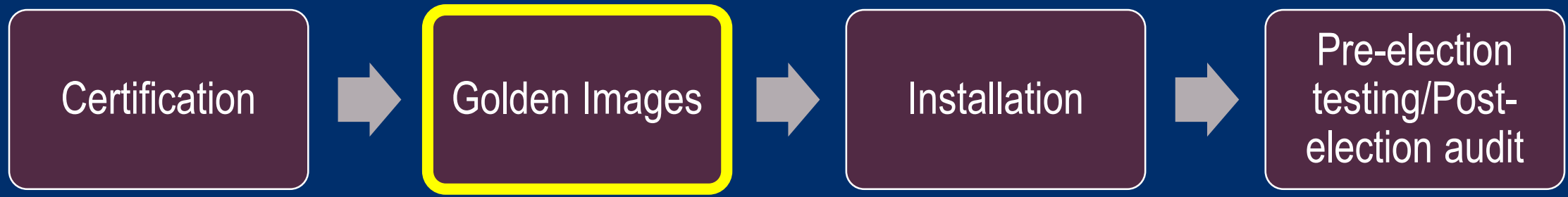
# Golden Image Root Drives

When the installation process is complete and the system is thoroughly tested to make sure it is properly configured, images of all components across all computer models are created and saved onto a Root Drive. These image files are the Golden Images. The images on the Root Drive are copied onto other media to be taken by Secretary of State staff to be installed across the state. After the copies are made, the Root Drive, which is encrypted, is deposited in a safe at the Secretary of State's office (along with an exact backup of the Root Drive in case the data on the Root becomes corrupted).



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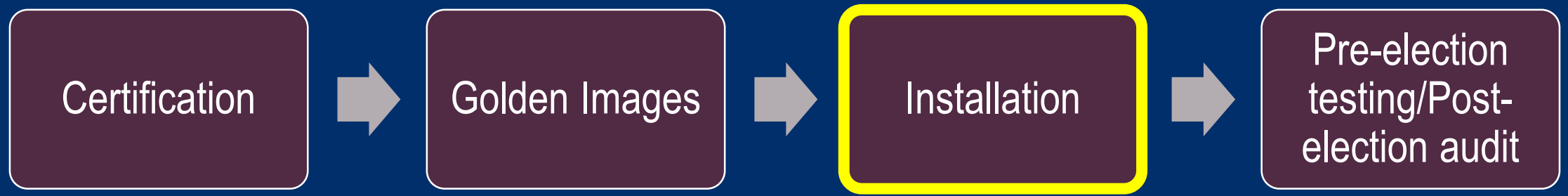
# Installation



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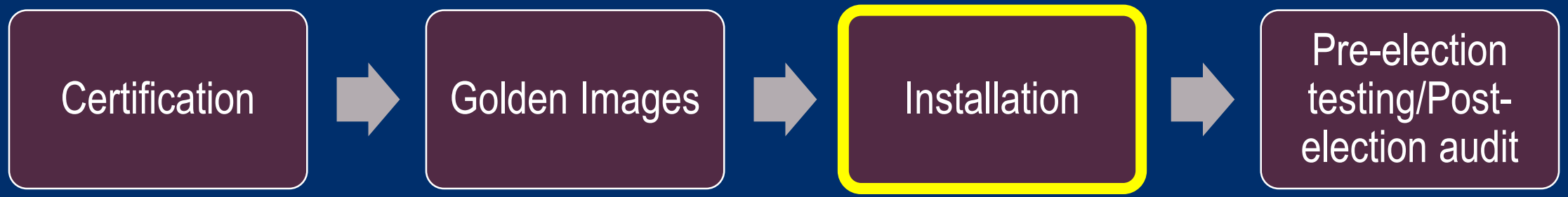
# Updating county voting systems

In Colorado, voting systems are forbidden from being connected to the internet. Because of this, installation of new software must be done with physical media. To ensure that the system is being installed correctly, and to safeguard the security of the tabulation software, only a limited number of background-checked Secretary of State staff may possess, and therefore install, the Golden Images that contain the certified voting system software on the voting system computers throughout the state.



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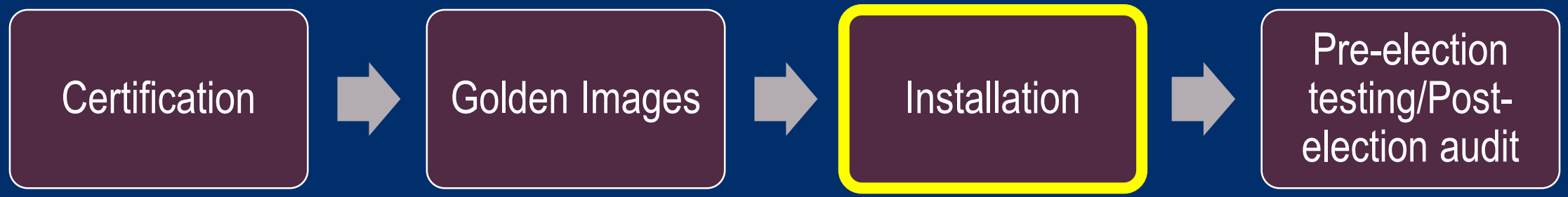
# Maintaining Chain-of-custody

After the Root Drive is used to create the media to be used by Secretary of State staff, the new media is secured in locked cases going forward. The cases are also sealed with serialized tamper evident seals. When Secretary of State staff arrives in a county to install the Golden Images, a member of county staff and the Secretary of State staff verify the seal number is the same as what was written down when it was last sealed. This process is to ensure no one accessed any media. Two signatures are always required to verify seals.



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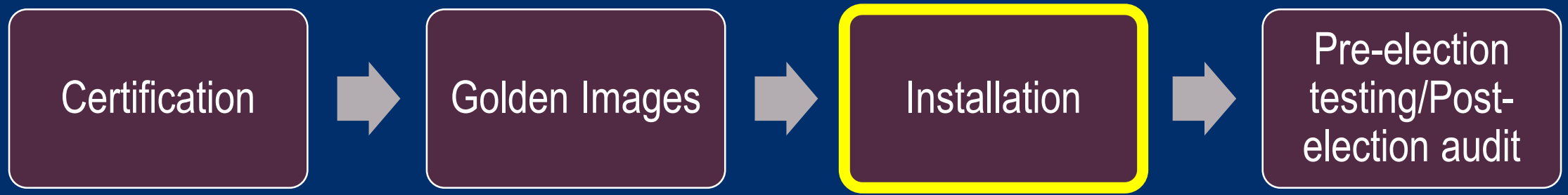
# Installing the Images

During the in-county voting system installation Secretary of State staff and voting system provider staff perform different roles throughout the process. The State staff is responsible for the integrity of the voting system software, including installing the images, checking BIOS settings, and hardening components. Voting system provider staff is responsible for any configuration that must be done after the installation of the image.



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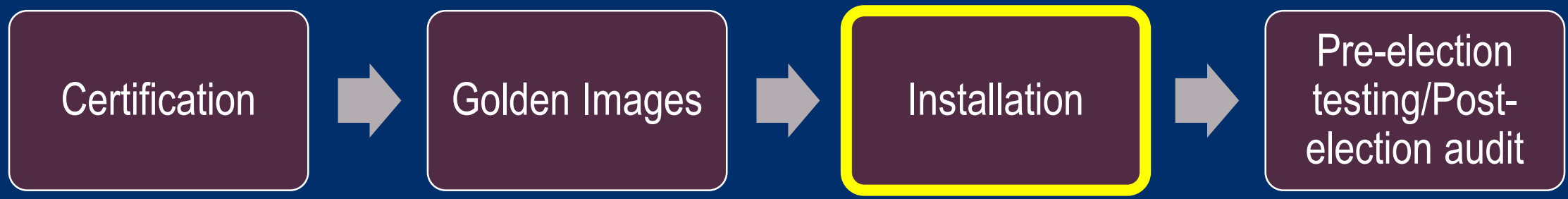
# Acceptance Testing

The final step in the installation of the voting system is acceptance testing by the county. This involves going through steps normally undertaken during a real election, but on a much smaller scale. It includes creating or loading a test election on all devices, using ballot marking devices to mark ballots, running ballots through tabulation scanners, and verifying that the results from the system match the count from the ballots. Upon completion the county signs off that they have accepted the voting system.



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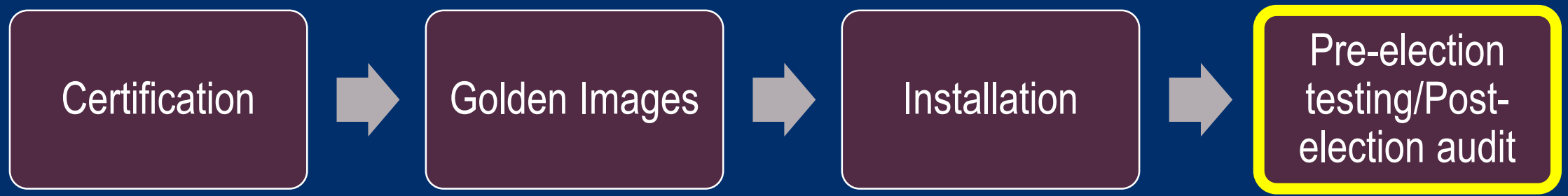
# Pre-election Testing and Post-election Audit



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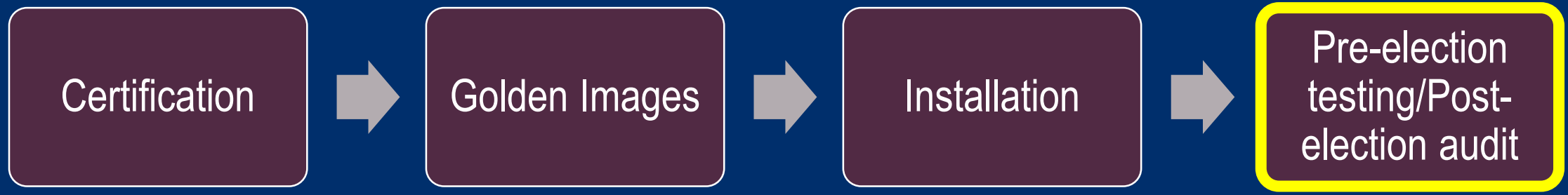
# Hardware and Diagnostic Testing

Pre-election testing begins with the Hardware and Diagnostic Testing. This is basic testing to make sure all the equipment hardware is functioning properly so that failures during the election are kept to a minimum. It includes things like making sure the screens turn on, making sure data ports work, making sure card readers function, cleaning scanners, making sure batteries are charged, etc.



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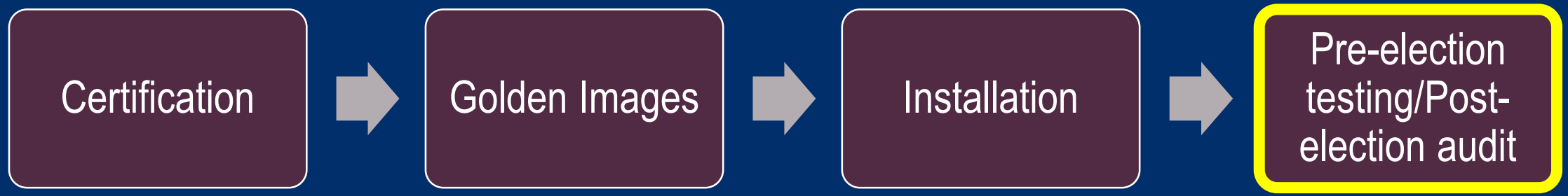
# Logic and Accuracy Testing (LAT)

The LAT is testing done with the actual election database. Its purpose is to make sure the votes are counted accurately. LAT is done with both a county pre-marked test deck of ballots and ballots marked by hand by a testing board. The pre-marked ballots test all positions on each ballot style and overvotes and undervotes. The hand marked test ballots are marked by the bi-partisan testing board, which is comprised of designated members of the major political parties in the county. The results from scanning the test ballots are compared to the results that were hand tallied. These members also test equipment used to assist voters that use accessibility devices. Once LAT testing is completed, counties may not make changes to the election database. LAT testing is governed by 11.3.2(a), and must be completed no later than 21 days before election day.



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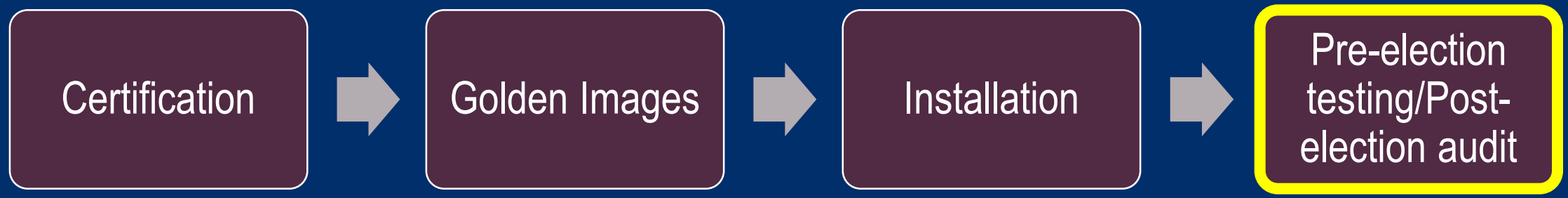
# Post-election Audit

Colorado's post-election audit is called a Risk-Limiting Audit (RLA). Each county carries out an RLA after each election. Before the RLA the Secretary of State chooses target contests in each county and at least one statewide contest. The criteria for choosing contest can be found in Rule 25.2.2(j). Counties then have bi-partisan audit boards comprised of members of the public retrieve specific ballots and then the markings on the ballot are compared with the results in the voting system. If the results match across all the ballots, we can have a very high degree of statistical confidence that the outcome of the election was correct. Since Colorado started performing RLAs in 2017, no race has ever been found to have the wrong outcome. You can find more information about the RLA here.



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# Conclusion

The certification and verification process is meant to ensure that the tabulation systems used in Colorado count the votes of Colorado voters accurately. Both the Secretary of State and counties throughout the state take maintaining the integrity of each election very seriously, and a big part of that involves the integrity of the voting system. While the slides here cover the process from beginning to end, they only provide an overview of everything that is done, not the fine details of each step. For additional information please e-mail elections@ColoradoSOS.gov.