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PCBA - Handling Guidelines

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Walk Through Process

It is recommended to conduct a daily walk on the shop floor and observe how the products are handled by operators or engineers on the shop floor. This is one of the critical key point of GEMBA walk on an PCBA shop floor.

We can also use Ohno circle as a technique to find out abnormalities. There is a circle marked and the observer will stand into the circle and observe the board handling on the shop floor.

Walk Through Process

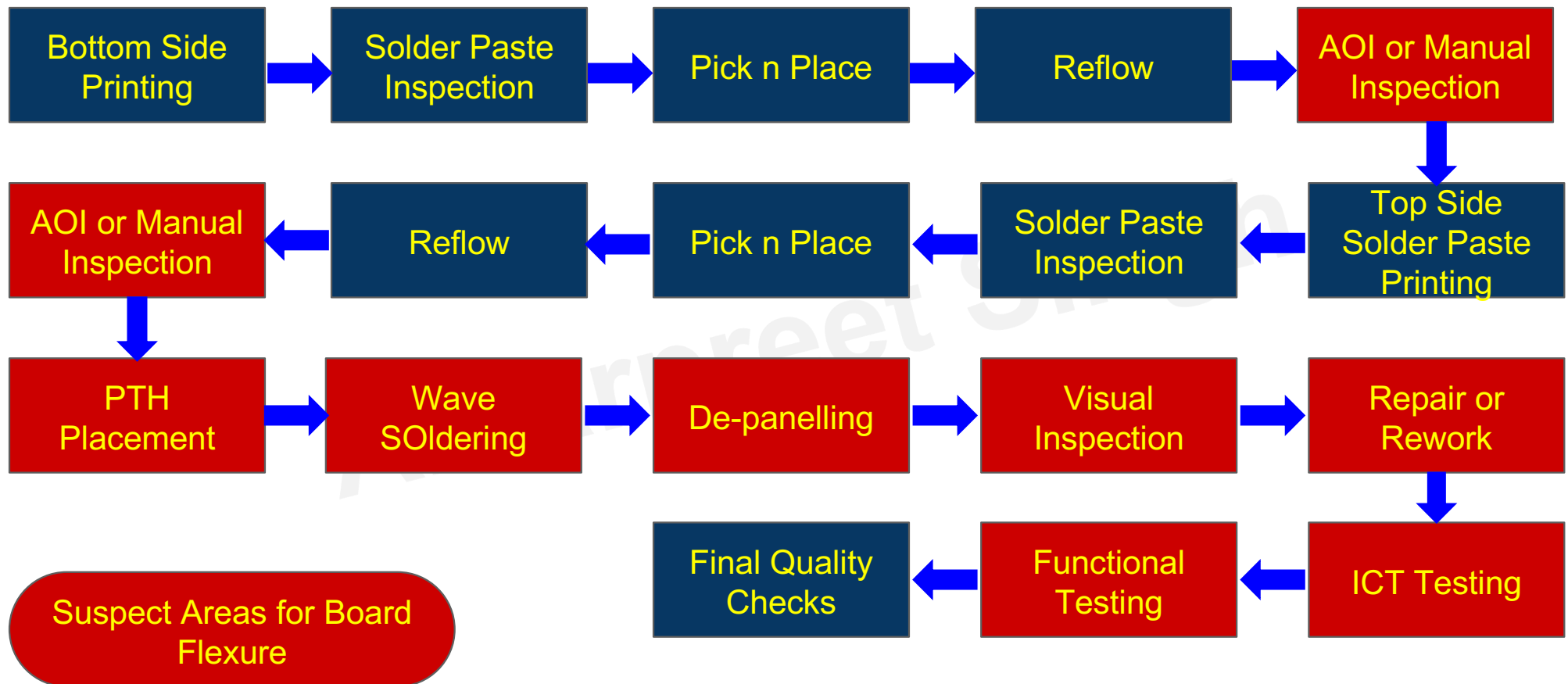


GEMBA Walk



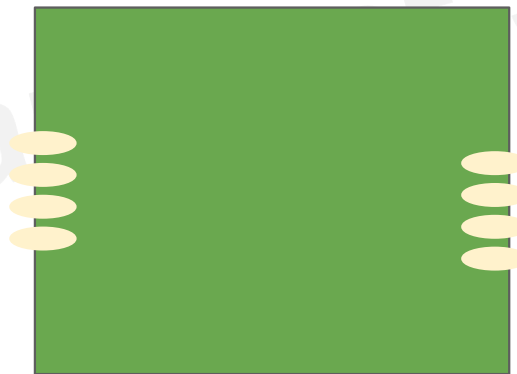
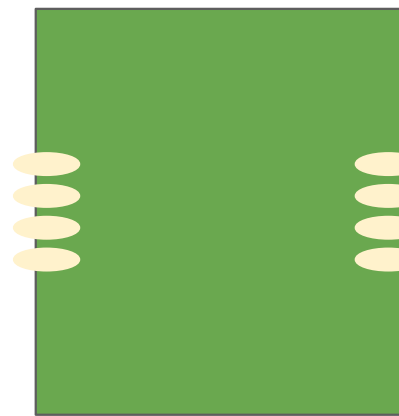
Ohno Circle

Typical PCBA Process Flow

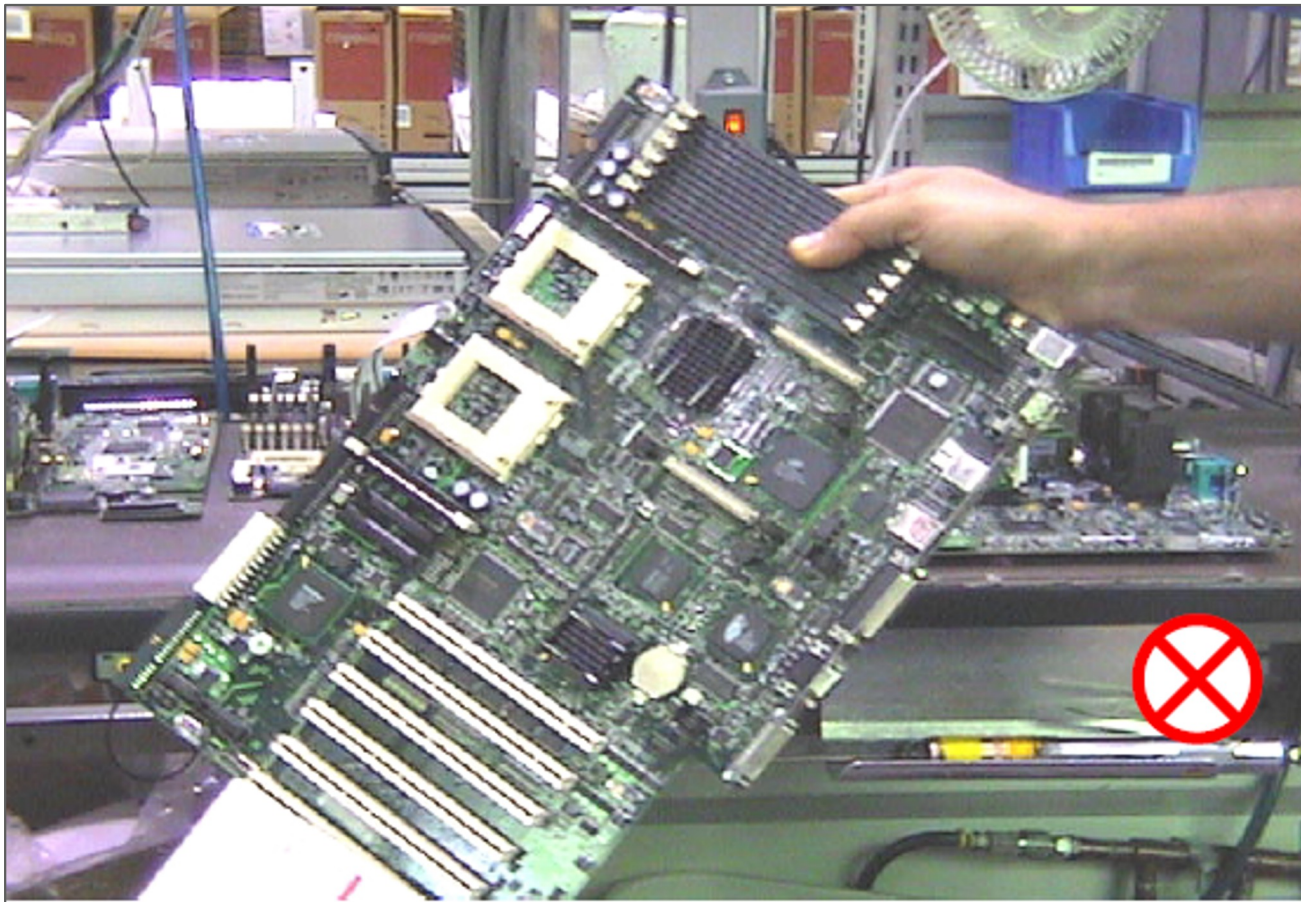


Guidelines for Board Handling

- ❖ For medium to large size board, use both hands to pick the PCBA.
- ❖ Always hold board from the short axis
- ❖ Avoid holding the board from long axis
- ❖ Avoid holding the board from one end

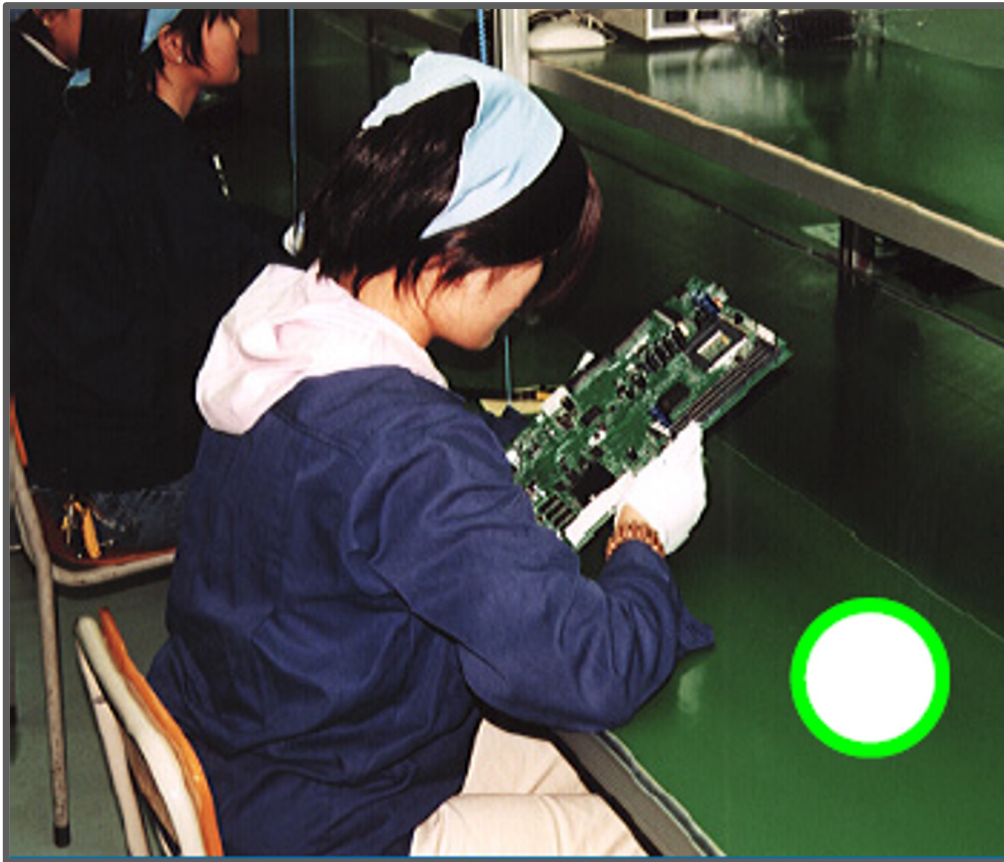


Poor Handling



- ✗ Avoid holding the board from long axis
- ✗ Avoid holding the board with one hand

Proper Board Handling



Use both hands to hold the board from short axis

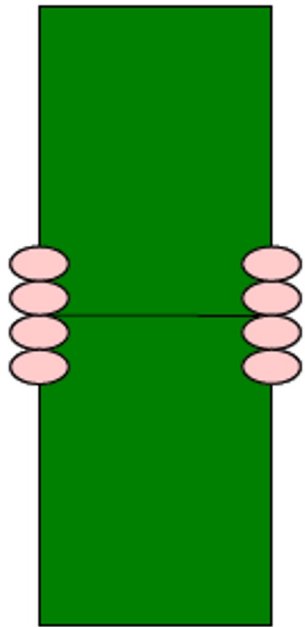
Avoid placing the board on the table with long end on the Y-axis.

Avoid placing the board upside down W/O fixtures.

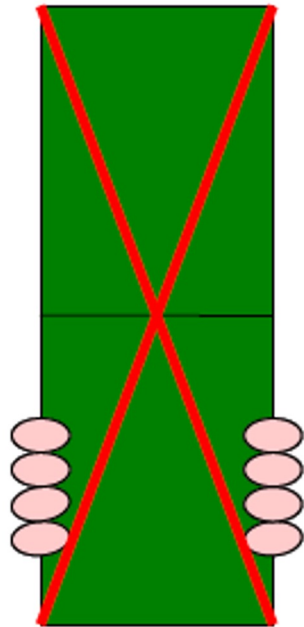
Do not hold the board with one hand and on long axis.

Hold the board with ESD hand gloves.

Multiple Board Panel Handling



Best Practice

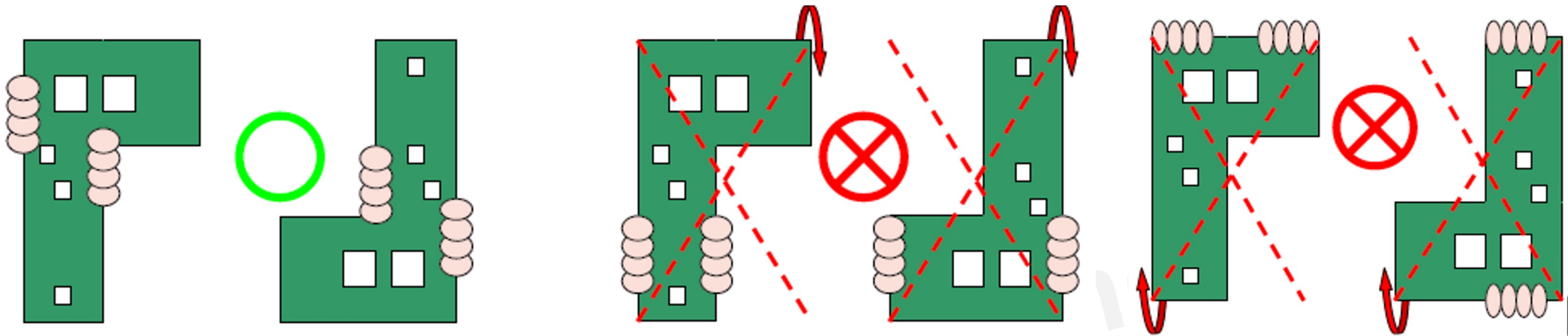


Poor Practice



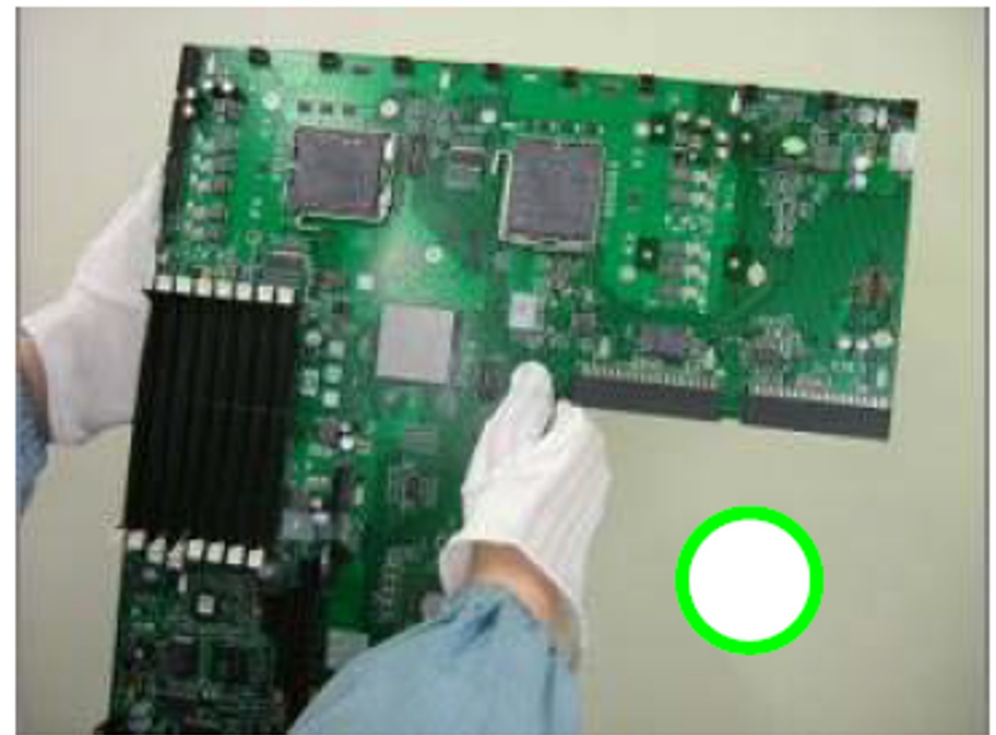
- A Multiple board panel is usually longer compared to a single PCBA.
- We cannot hold the board from one end of the panel, as it will result in board flexure.
- We also should not hold the panel using one hand.
- The right practice is to handle the panel from the middle using both hands.

“L” Shaped Board Handling



- An “L” shape board is not easy to handle so special training is required for operators.
- We cannot hold the board from the ends as per the pictures above.
- The best way to handle an “L” shape board is by holding the board with both hands from the middle, with one hand slightly above the transition zone on the wider side.

"L" Shaped Board Handling

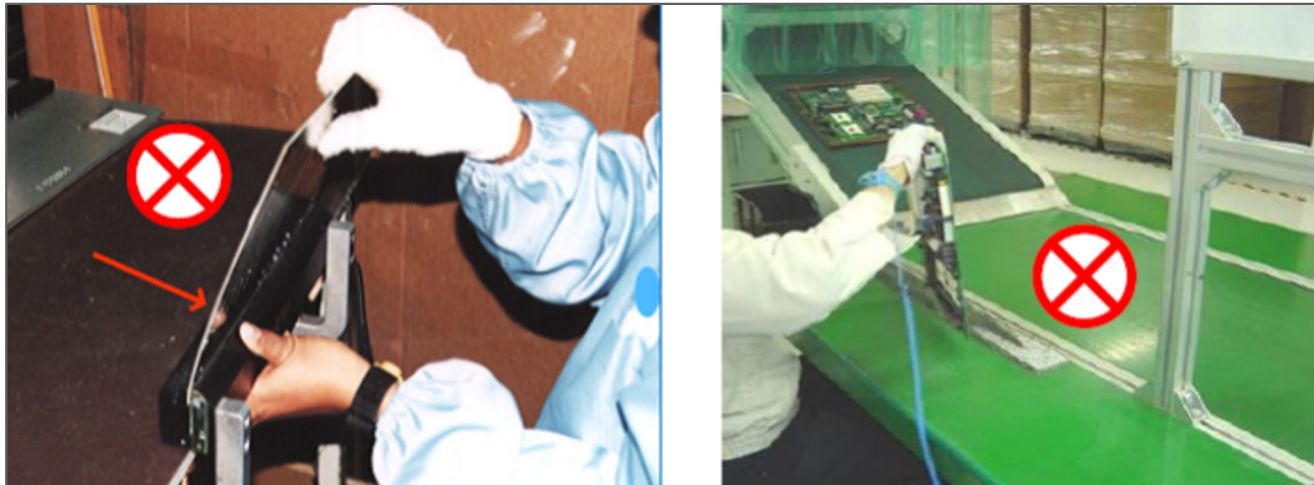


Excess Handling of the PCBA



An example of excess handling is where operators push the board into Reflow oven. This can actually disturb the components mounted on the board.

PCBA Handling During Depanelling Process.



Depanelling is one of the most sensitive area causing component cracks or internal PCBA cracks. This happens mainly due to

- Improper fixture design
- Improper or non availability of procedure
- Boards are handled holding vertically

PCBA Handling During Depanelling Process.



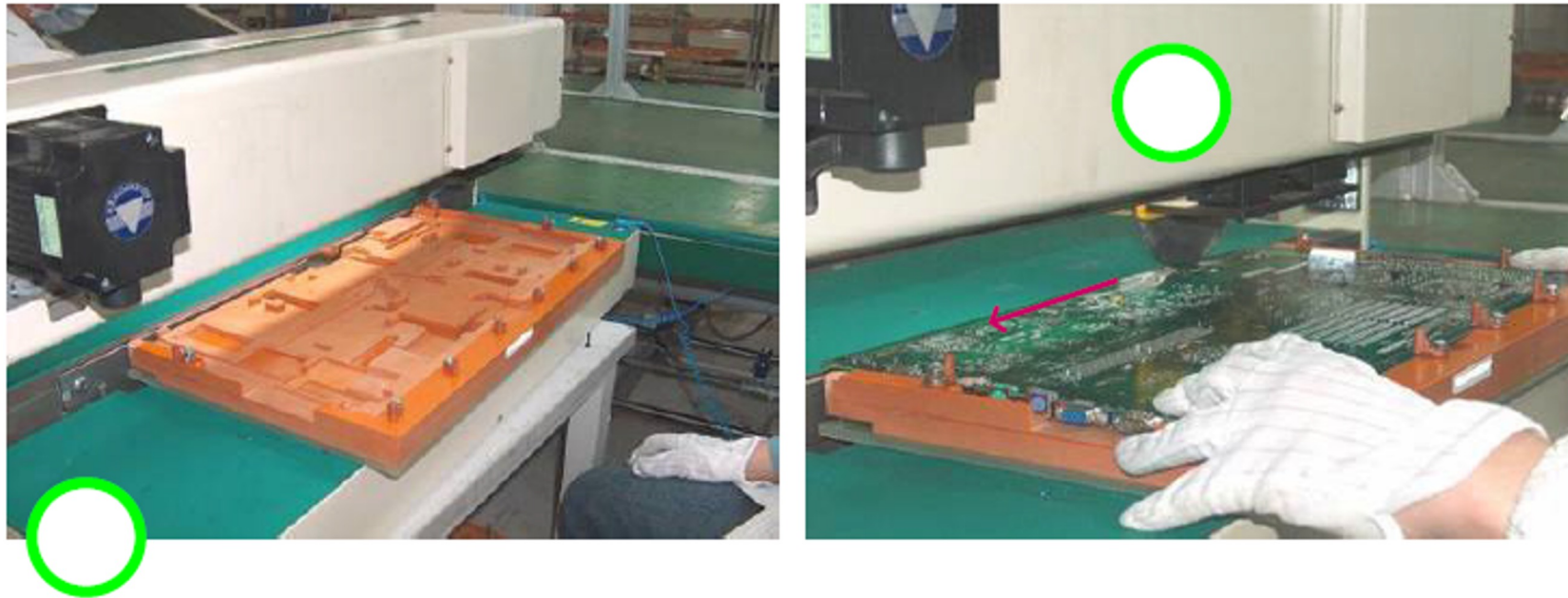
PCBA Handling During Depanelling Process.

Good Practice

- Board should be placed on a flat surface rather than using hands to hold the board.
- A universal fixture must be in place to handle the PCBA during the de-panelling process.
- The purpose of this universal fixture is to hold the board flat on the surface during the de-panelling process.
- Use router or a similar tool to cut the break away table while board is lying flat on a surface.

Depanelling Fixtures

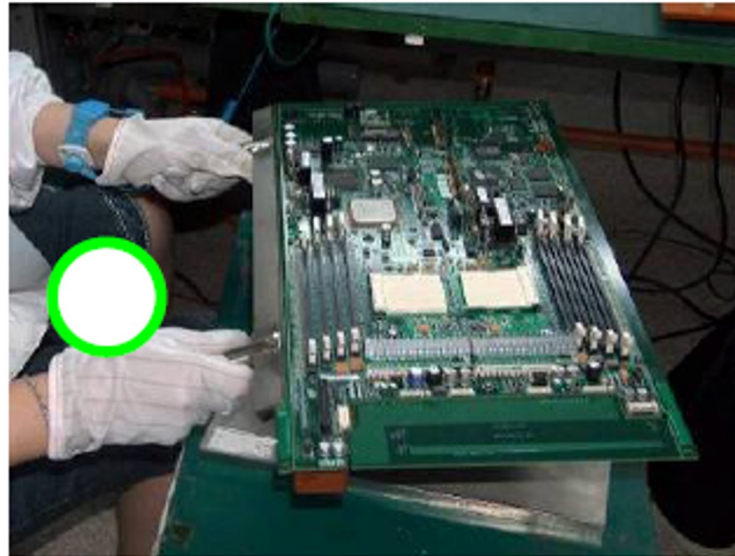
Good Practice



Use universal fixtures that position the board on a flat surface

Depanelling Fixtures

Good Practice



- Ensure that the bottom side of the components do not touch the fixture. This is to avoid component damage during the depanelling process.
- Ensure the board is lying flat on the fixture

Depanelling Routers

Good Practice



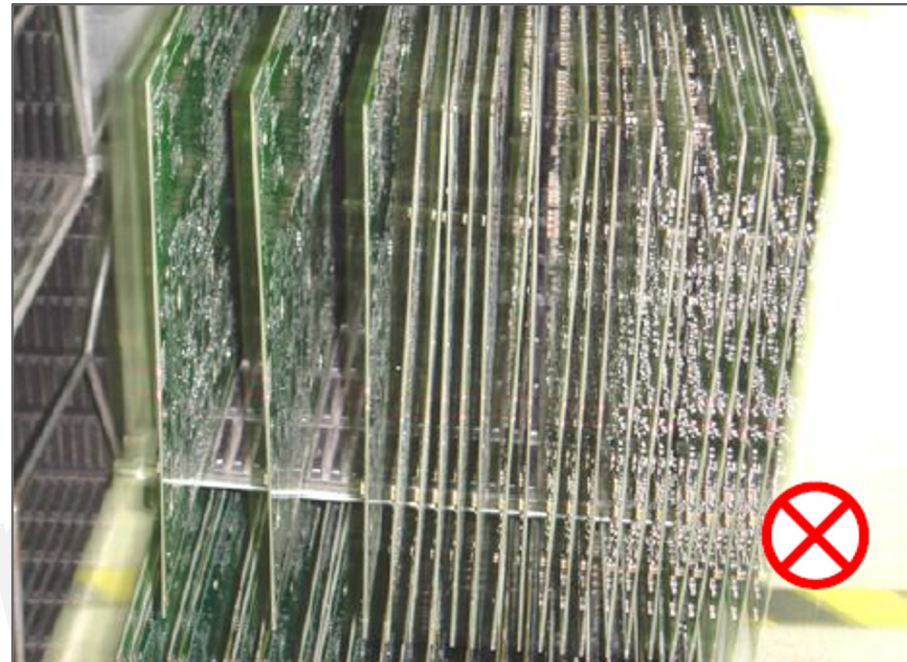
PCBA Transportation and Storage

- Sometime the SMT and Pth Lines are located at a distance and the PCBA are required to be moved on the shop floor. The same happens with the rework stations as rework stations are usually centralised locations.
- Improper handling of the boards may cause flexure and generate quality and reliability issues.

Risks

- Placing PCBA vertically in the racks can cause components damage.
- Using soft materials for PCBA storage can cause components damage
- Using pink foam for storage is also not a good practice.

PCBA Transportation and Storage



PCBA Should not be stacked vertically and too close as this might cause component damages.

PCBA Transportation and Storage



Do not use soft Partition materials.



Do not use soft Plastic storage trays.

PCBA Transportation and Storage



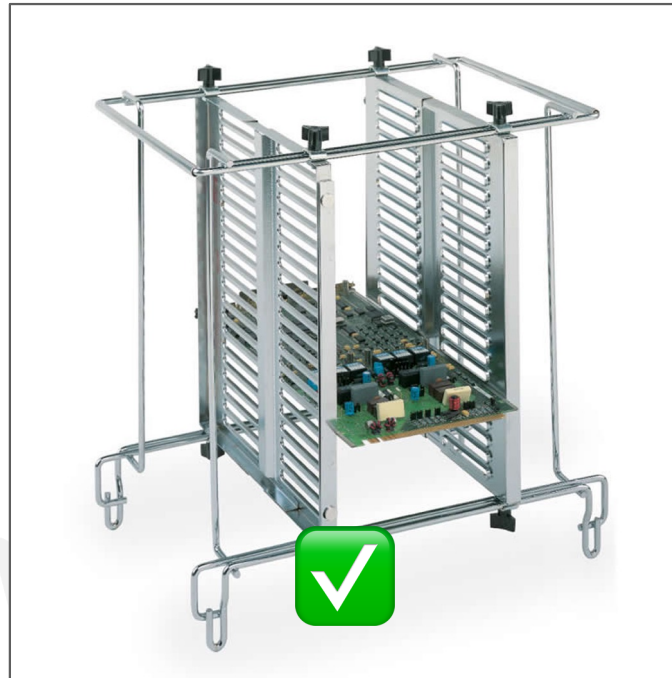
Do not use Pink foam for PCBA storage

Board Transportation / Storage

Good Practice

- Unnecessary handling of the PCBA should be avoided at all the times.
- If boards have to be transported from one place to another, it is suggested to have a wheeled cart with smart trays and Vinyl inlay mats to avoid board flexure and any damage to the components.
- We also needs to use stiff trays for avoiding board flexure

Board Transportation / Storage



Board Transportation / Storage

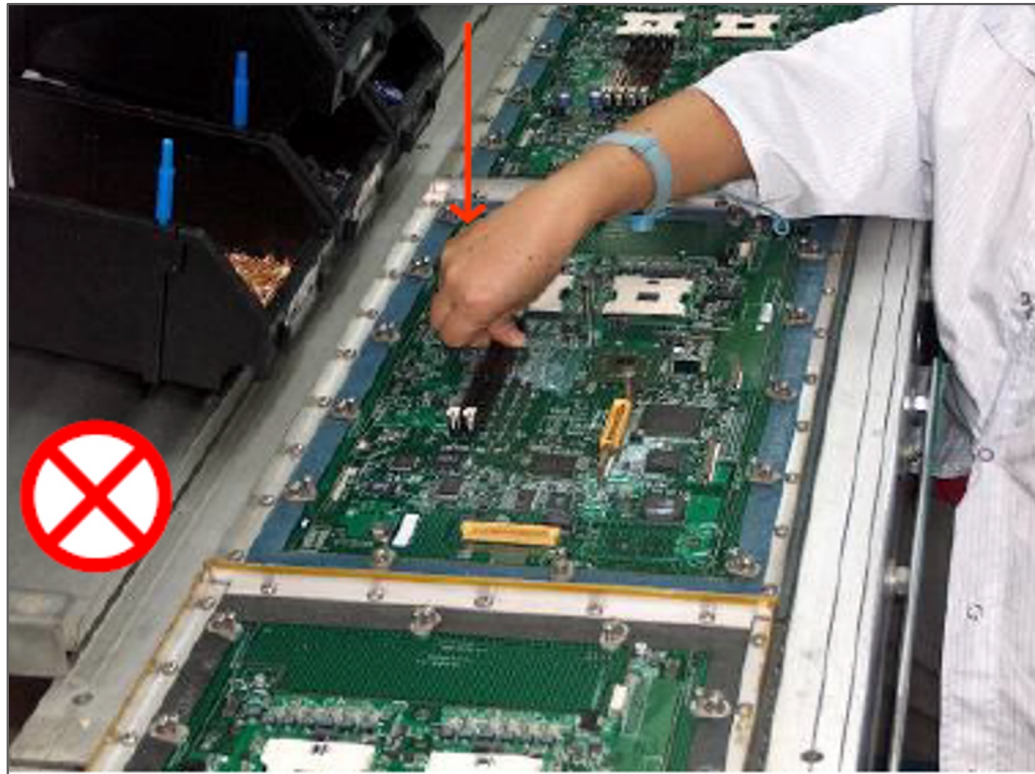


Manual Insertion Stage

Potential Issues

- Improper insertion of big / tall components
- Lack of adequate support while inserting snap on components. (Power connectors, DIMM connectors etc)
- Excess force might cause board flexure during the insertion of snap on connectors
- Floating inspection operators usually push down the components to ensure full insertion, but that actually causes board flexure and can lead to reliability issues.

Manual Insertion



- Lack of adequate support while inserting DIMM connectors
- Do not insert more than one DIMM connectors at one time

Manual Insertion Stage

Good Practice

- Using support fixtures while mounting snap on or heavy magnetic (Transformers, Coils) components.
- DIMM Connectors should be inserted one at a time.



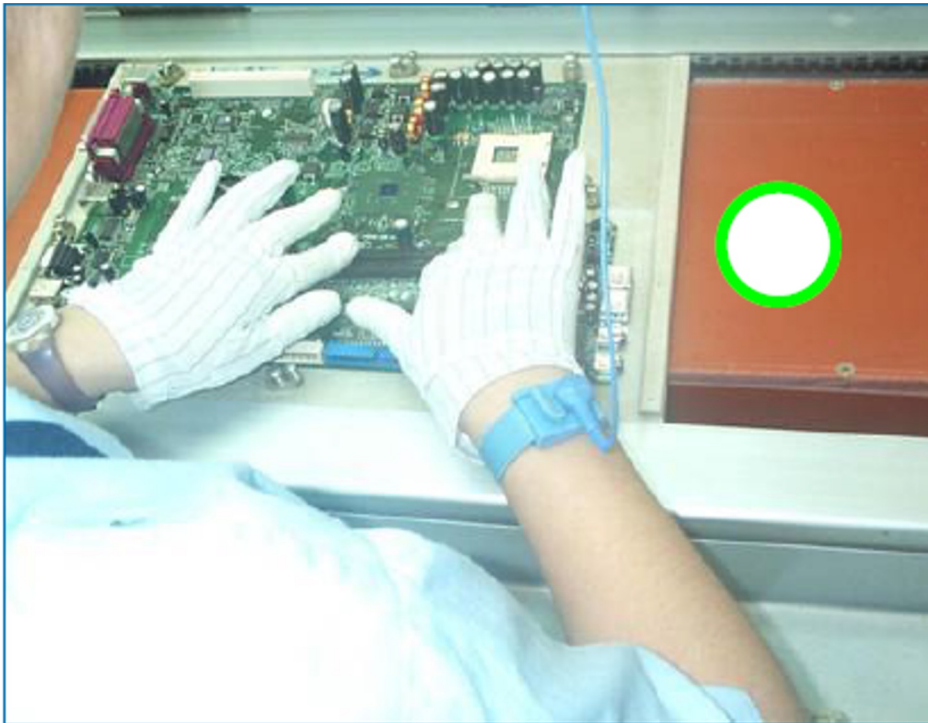
Manual Insertion Stage



Good Practice

- Use Individual rigid pallet on each board during insertion process.
- Pallets should be designed of rigid ESD safe materials to provide adequate mechanical support during manual insertion and wave soldering process.

Manual Insertion - Visual Inspection



Good Practice

- Avoid excess force on DIMM connectors and snap on components
- During the inspection if some of the components needs to be pressed, it should be done very gently.

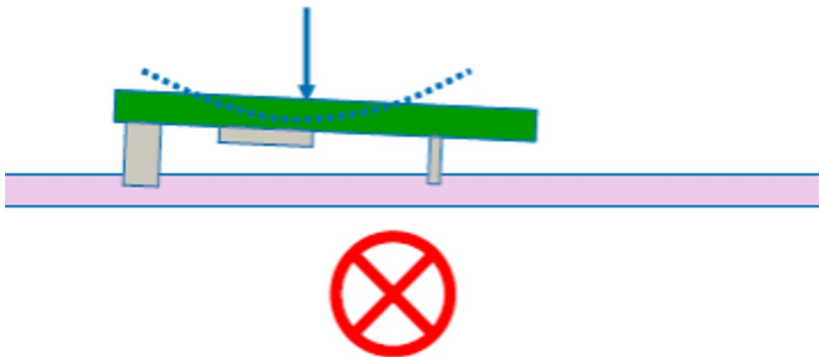
Post Wave Operations

Potential Issues

- Improper handling of the PCBA
- Boards lying upside down with components touching the conveyor or the trays
- Operators accidentally lean on the board or rest their hands on the PCBA, putting pressure on the PCBA.
- Boards are held vertically without proper support fixtures and soldering or other operations are performed.

Post Wave Operations

Potential Issues



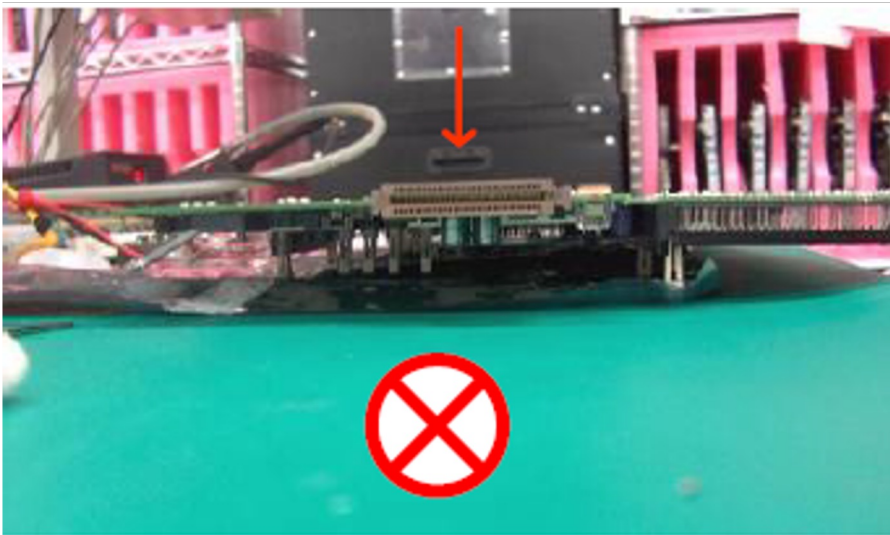
- When a PCBA is placed upside down on the work table, the board tends to bend on the centre or corners (depending on where the heavy components are located).
- Avoid keeping pink foam under the PCBA as it doesn't provide the required support as illustrated in the picture.

Poor Practice



Placing boards Top Side down is a poor practice and and cause components damage and board flexure.

Poor Practice

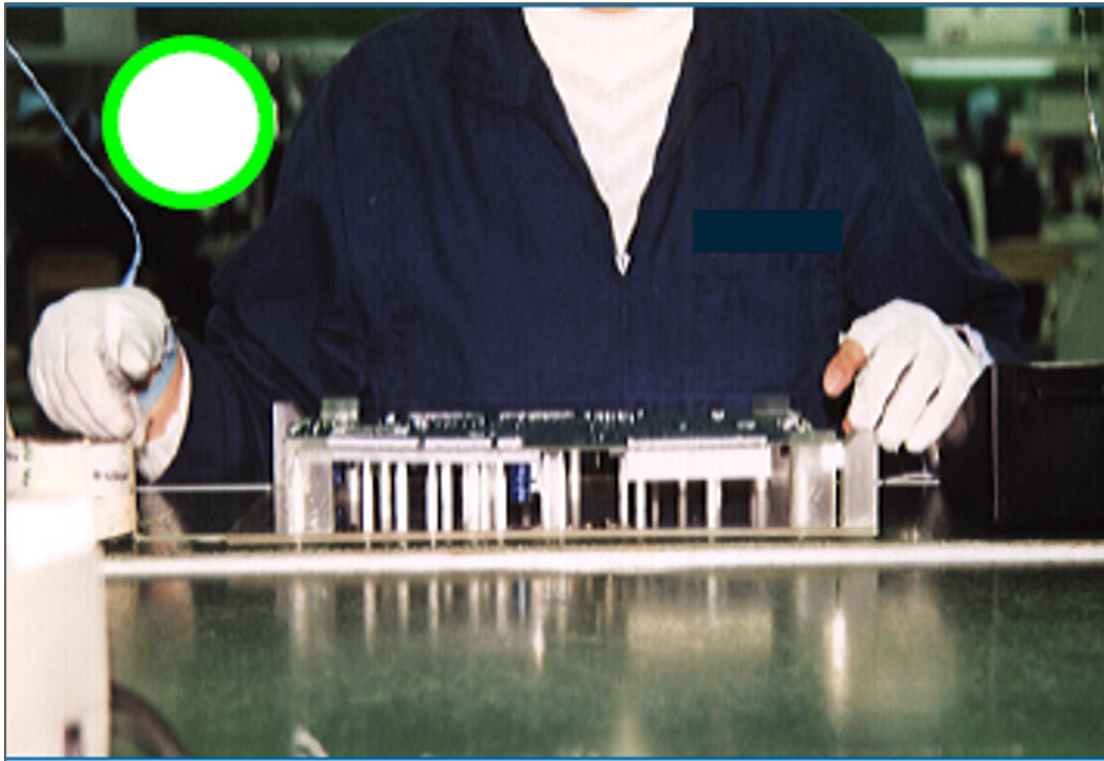


Potential Issue - Operators typically place the board upside down might cause board flexure and component damage.

Fixtures For PCBA Support

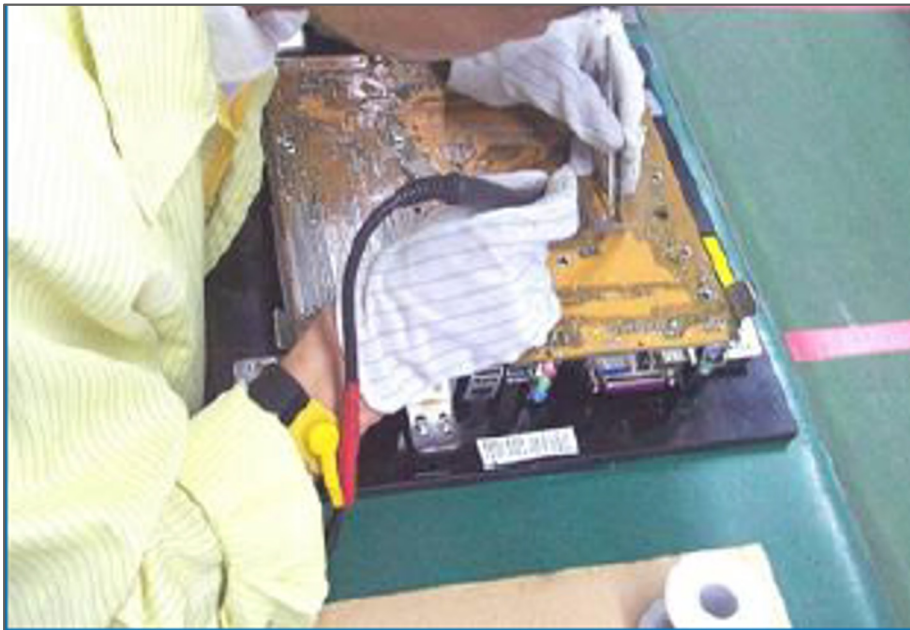
- **Top Side Fixture** - Fixture is required when work like soldering, cleaning etc. is done on the bottom side of the PCBA a Top side fixture will prevent the board from leaning on the work table.
- **Bottom Side Fixture** - Fixture needed when force is required to insert snap in other components on the top side of the board.
- **Double Side Fixture** - Fixture needed when work is done on both side of the board, i.e. rework stations. The fixture should have top and bottom side access with free rotational movements.

Visual and Touch Up Stations

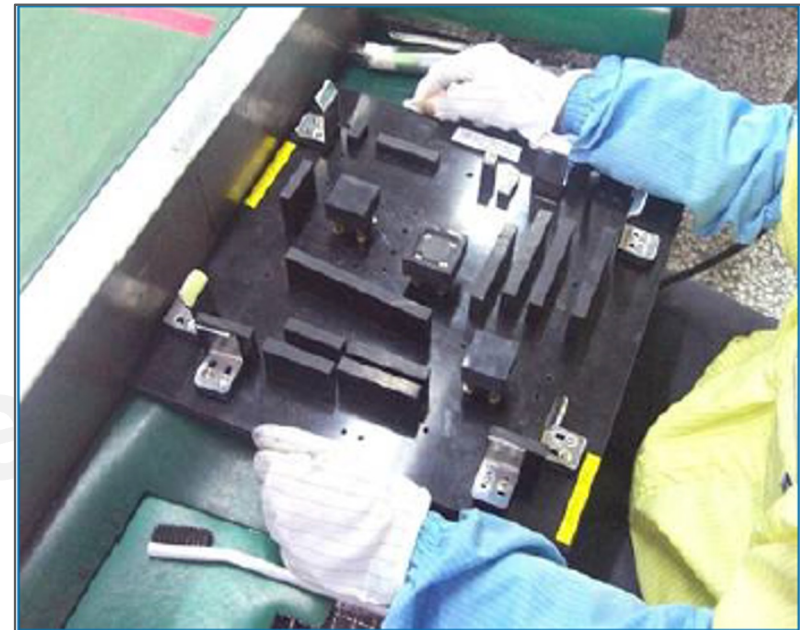


- Good Practice -
 - Never place boards topside down.
 - Any stations where the board needs to be placed topside down, a fixture needs to be provided so that board lay flat and to provide support for any pressure applied by the operator.

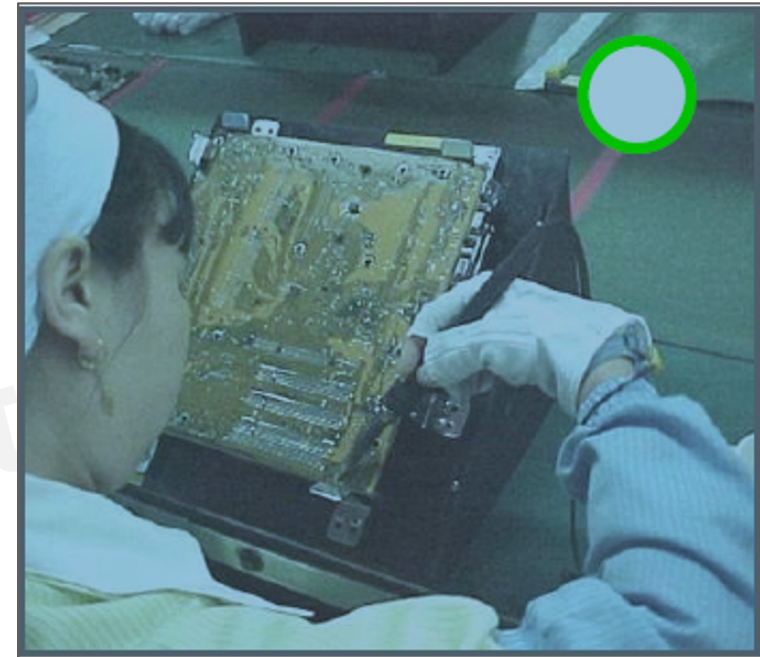
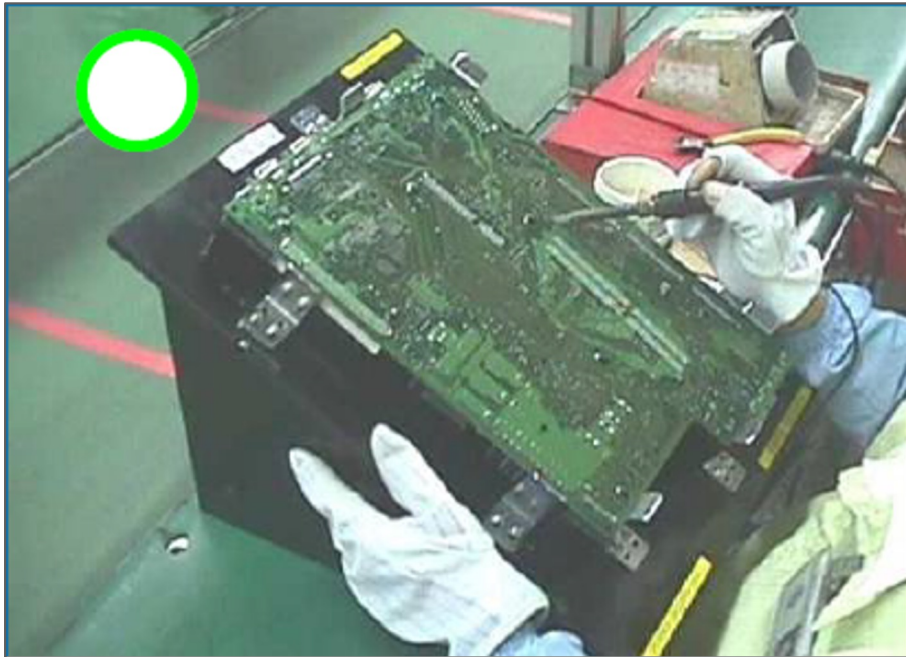
Visual and Touch Up Stations



Soldering Fixtures

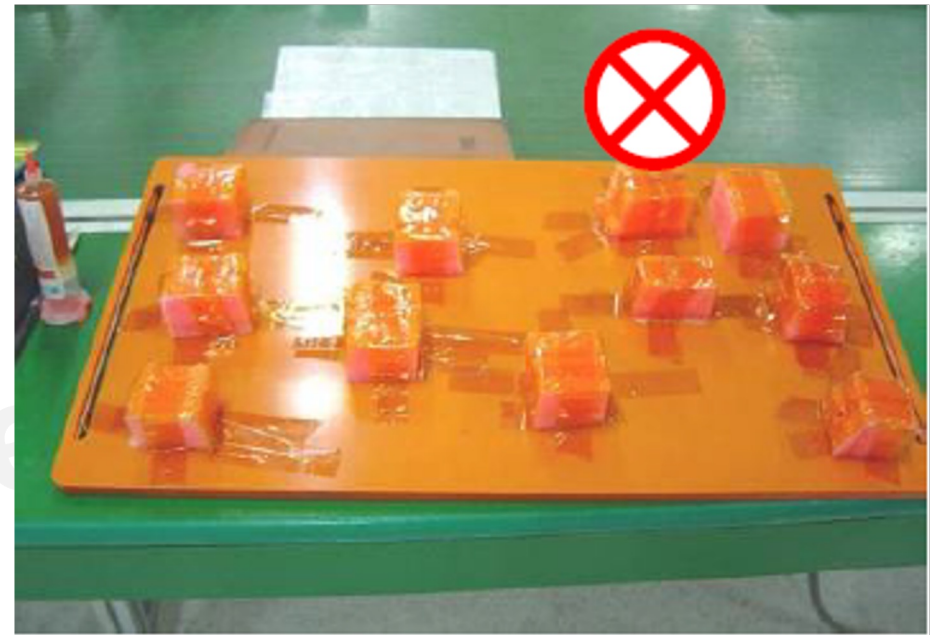
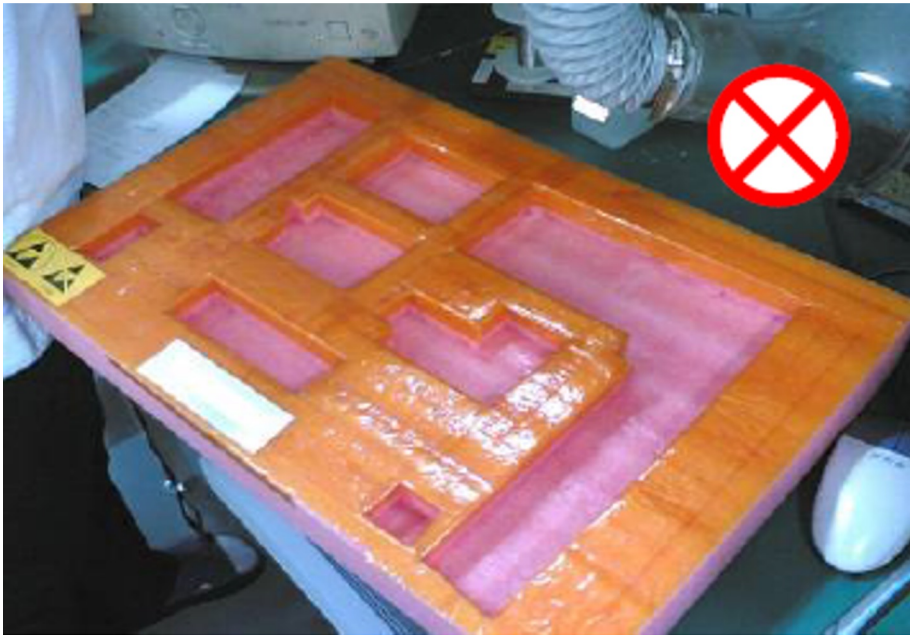


Visual and Touch Up Stations



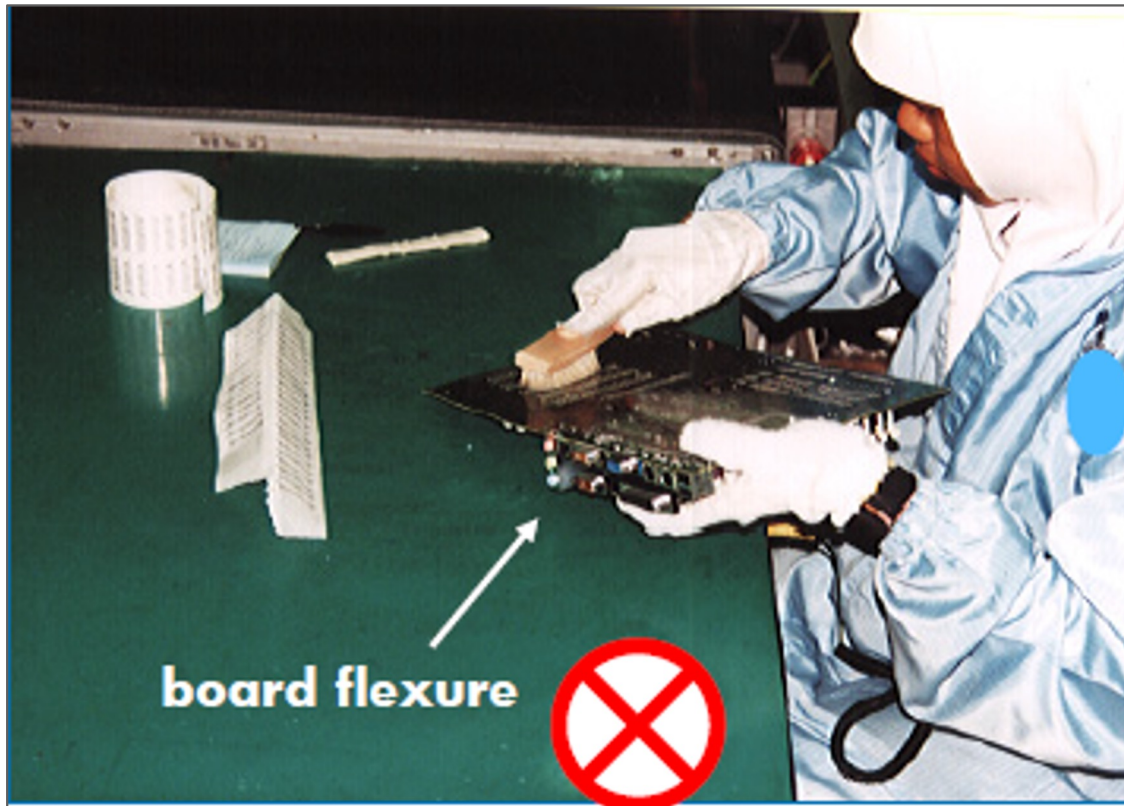
Soldering Fixtures

Visual and Touch Up Stations



Avoid using fixtures with soft support

Cleaning and Brushing Stations



Poor Practice -

- Cleaning done on the PCBA bottom side with Top side touching the table surface
- PCBA Held with one hand and pressure is applied on the PCBA for cleaning it. This will cause flexure on the PCBA.

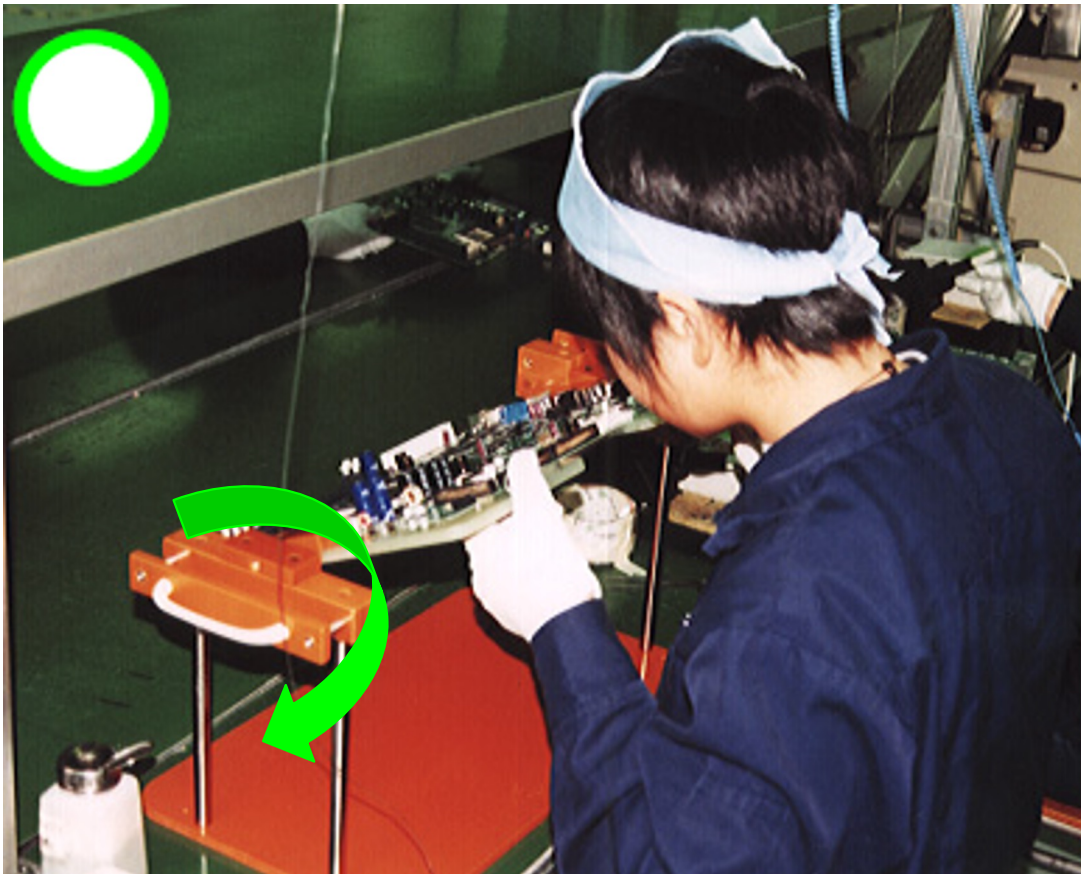
Cleaning and Brushing Stations



Good Practice -

- Topside fixture should be implemented so that the board stays flat and no bending occurs.
- Operators should be properly trained to properly clean the board without applying any pressure on the PCBA.

Rework Station



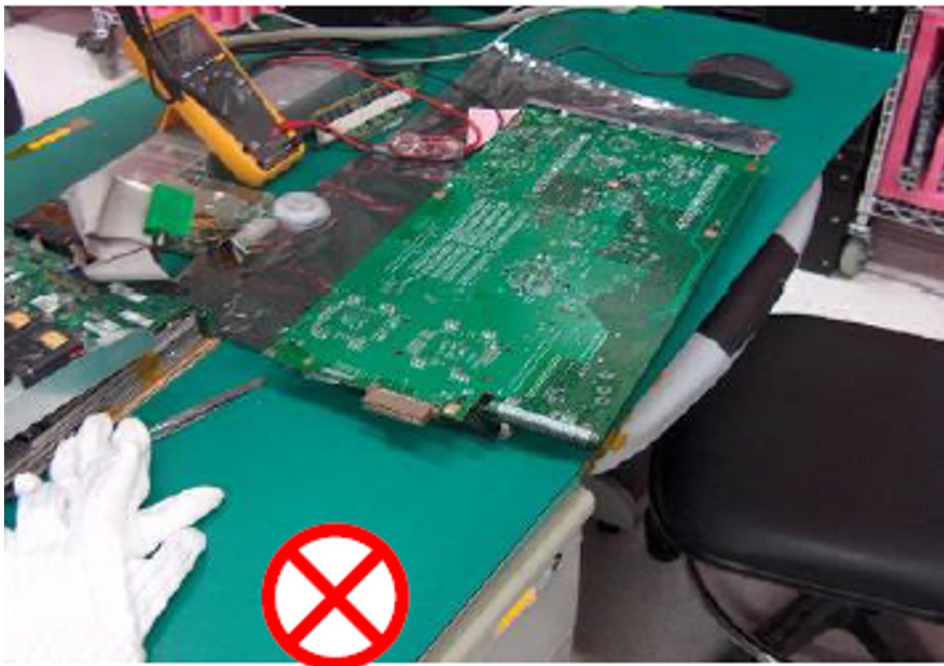
Poor Practice -

- Improper board handling
- Board lying upside down

Good Practice -

- Implement double side fixture
- Fixture should have Top and Bottom side acces with rotational movement.

Debug Area



- Avoid placing PCA upside down
- Avoid using pink foam for PCBA storage

Debug and Final Inspection

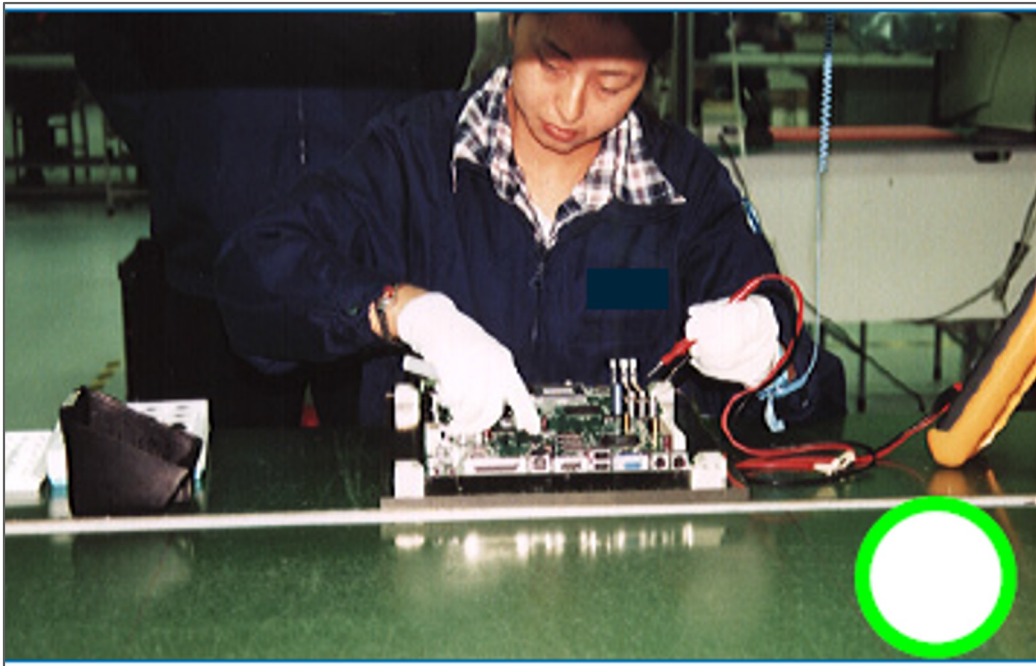
Poor Practice -

- Improper board handling
- Topside of the board resting against work table
- Pressing of components without support or fixture i.e. Battery, Snap in components, Dampers etc.

Good Practice -

- Implement double side fixture
- Fixture should have Top and Bottom side acces with rotational movement

Debug / Final Inspection Area



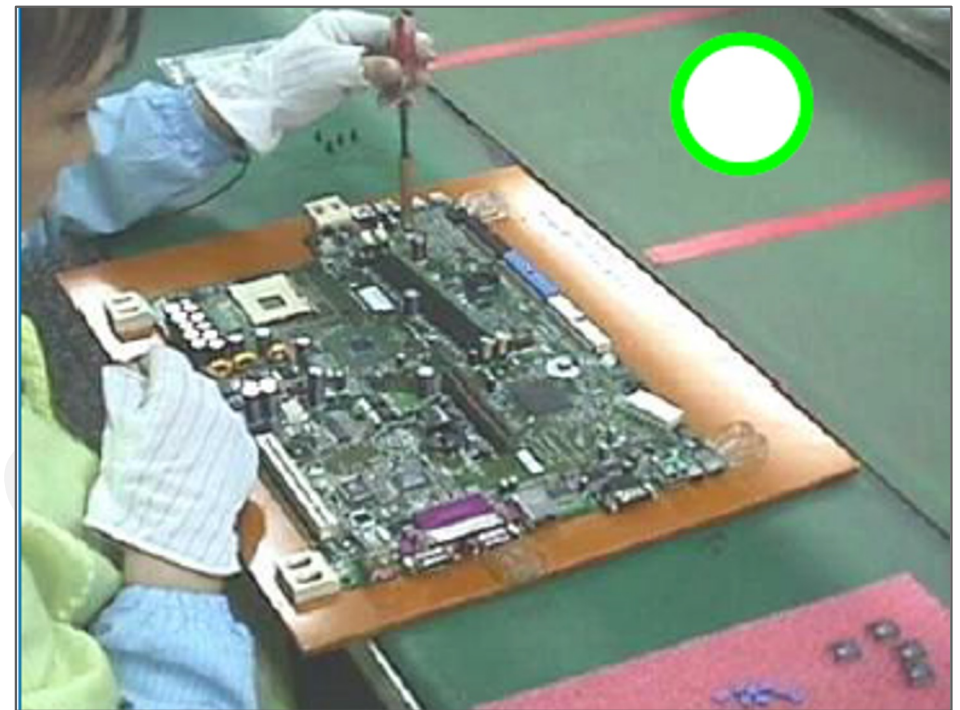
Good Practice

- If we really need to press the board for mounting of battery, Lock pins, clips etc a Fixture needs to be in place to avoid board flexure.

Debug / Final Inspection Area



Labelling



Adding Fastners

Packaging

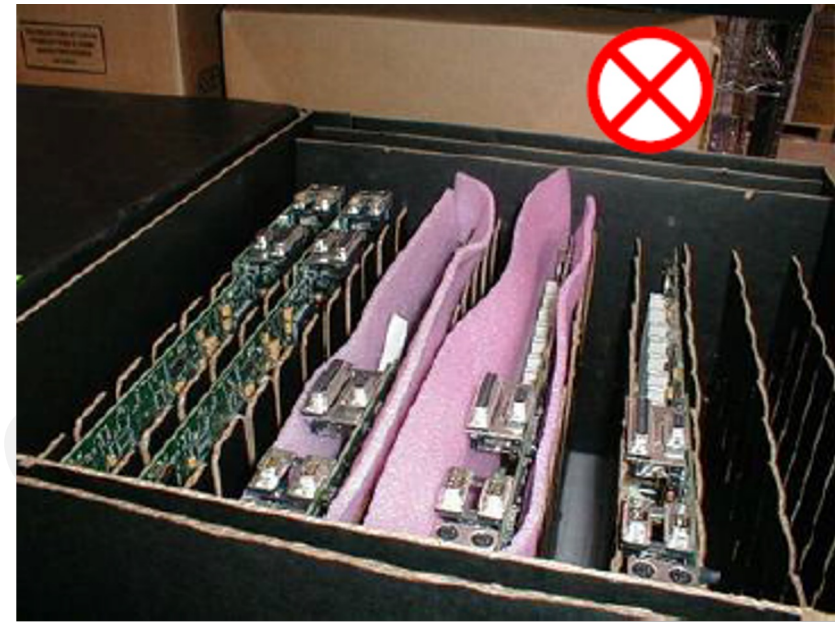
Poor Practice -

- Boards are packed in boxes which are not qualified for shipping.
- Unqualified boxes doesn't have adequate internal board support, foam etc.
- Inadequate board design (Board size Vs Box size).
- Board will flex or components will knock off if the board is improperly packed.

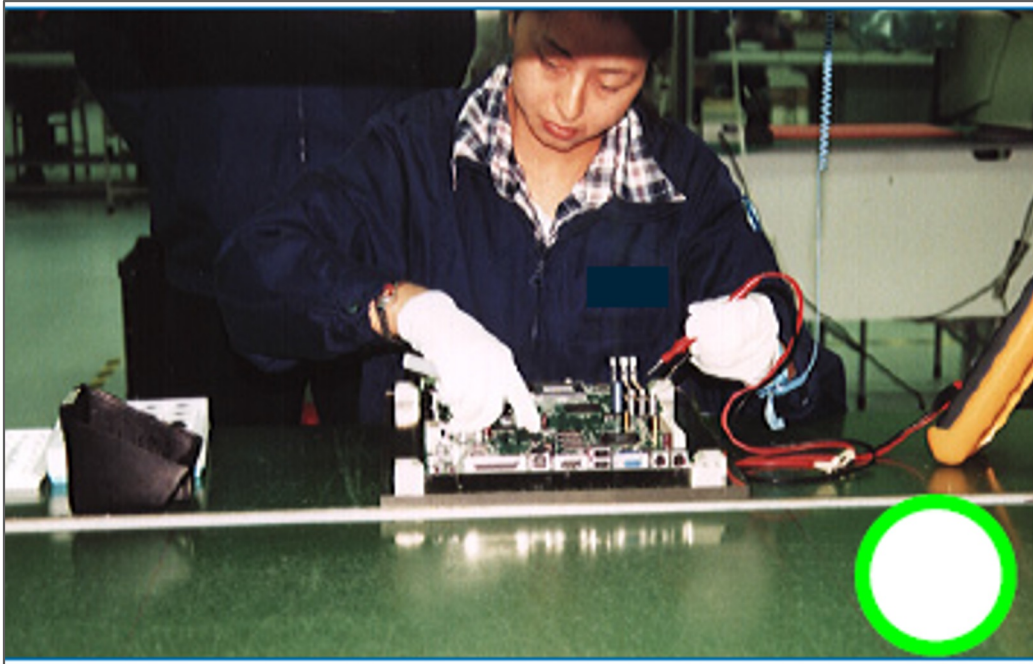
Good Practice -

- Conduct packaging qualification test
- The qualification test should include functional testing as well as reliability testing on the PCBA.

Packaging



Packaging



Good Practice

- Packaging boxes are designed to protect and prevent any movement of boards inside the shipping boxes
- It is a good practice to pack the boards with appropriate packaging to avoid board flexure.



Do you have more questions on topic ?

Please reach me at

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Thank You

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