ANSI/RIA R15.06-2012

Industrial Robots and Robot Systems Safety Requirements

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Standard History

- **ANSI/RIA R15.06-2012**
  Industrial Robots and Robot Systems-
  Safety Requirements
- **RIA TR R15.106-2006**

  Industrial Robots and Robot Systems-
  Safety Requirements –Teaching Multiple Robots
- **ANSI/RIA/ISO 10218- Part 1 & 2-2011**

  Robots for Industrial Environment-Safety Requirements

What's To Come

- Harmonized Vocabulary-
  Canada, Europe, Japan (World Wide)

- **10218 Part 2** – Came out in 2011
  Deals with the user

OSHA's Stand on ANSI/RIA R15.06-2012

- OSHA only sites under the General Duty 5(a)1 or the General Machine Guarding 1910.212
  - But OSHA recognizes R15.06 in OSHA Technical Manual Section IV – Chapter 4, The R15.06-1992

To Comply With the Standard

- New Robots built after 2012 must be built to the standard
- Rebuilt robots – original configuration
  - Compliance with standard in effect on date manufactured
- Remanufactured – new configuration
  - Compliance with 2012 Standard
- Moving existing cell
  - Cell must comply with 2012 standard
  - Robot deficiencies require compensation

What is a Robot? Definitions

- Industrial robot
  - Automatically controlled
  - Reprogrammable multipurpose manipulator
  - Programmable in three or more axis
  - Which may be either fixed in place or mobile
  - For use in industrial automation applications

Definition – Industrial Robot System

- Equipment that includes the robot(s) (hardware and software) consisting of the manipulator power supply and control system; the end-effector(s); and any other associated machinery and equipment within the safeguarded space.

Definitions - Space

- The three dimensional volume encompassing the movement of all robot parts through their axis.

Definition – Maximum Space

- The volume of space encompassing the maximum designed movements of all robot parts including the end-effector, work piece and attachments.

Definitions – Restricted Space

- That portion of the maximum space to which a robot is restricted by limiting devices. The maximum distance that the robot, end-effector, and work piece can travel after limiting device actuation defines the boundary of the robot's restricted space.

Definitions – Operating Space

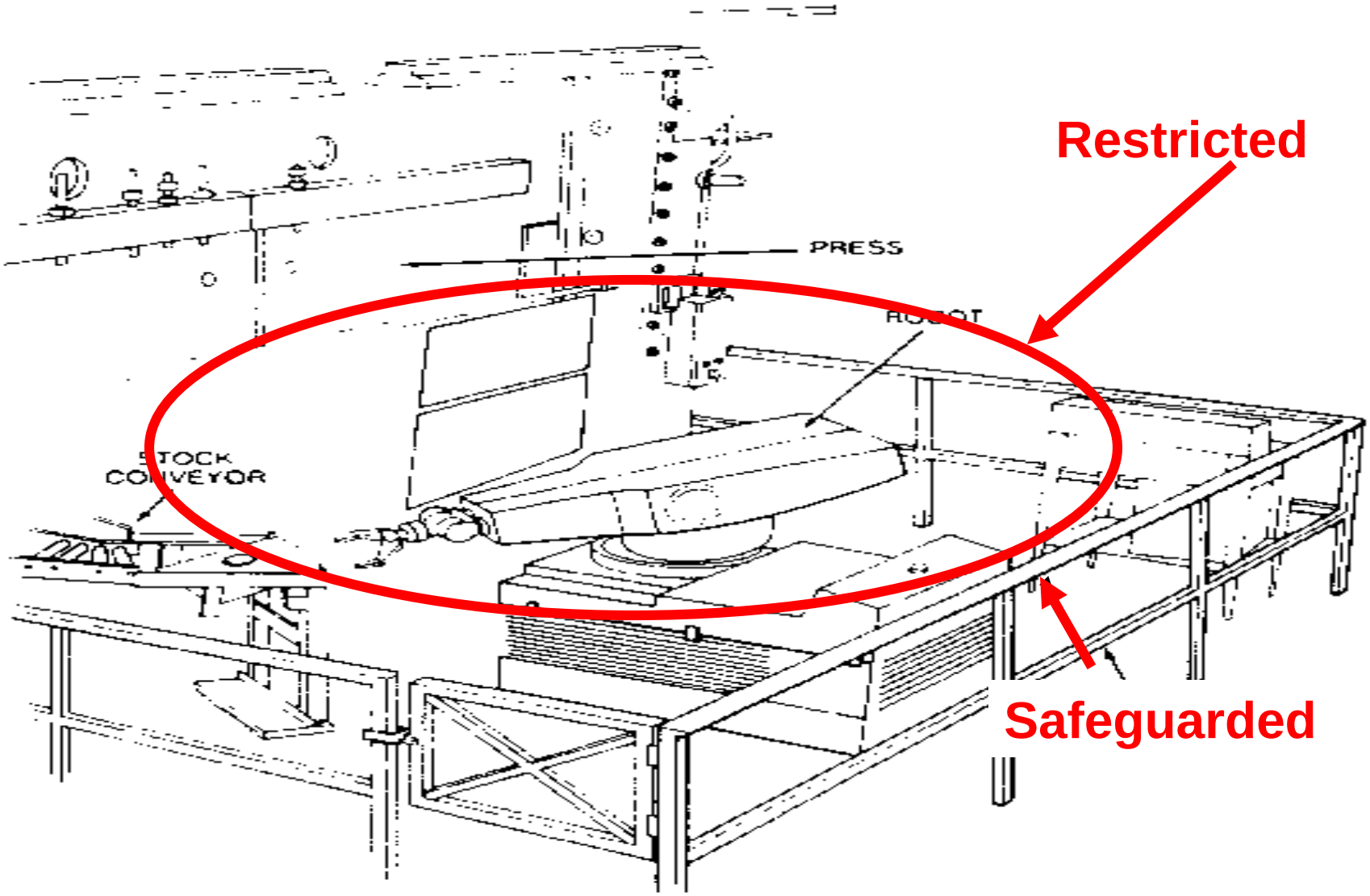
- That portion of the restricted space that is actually used by the robot while performing its task program.

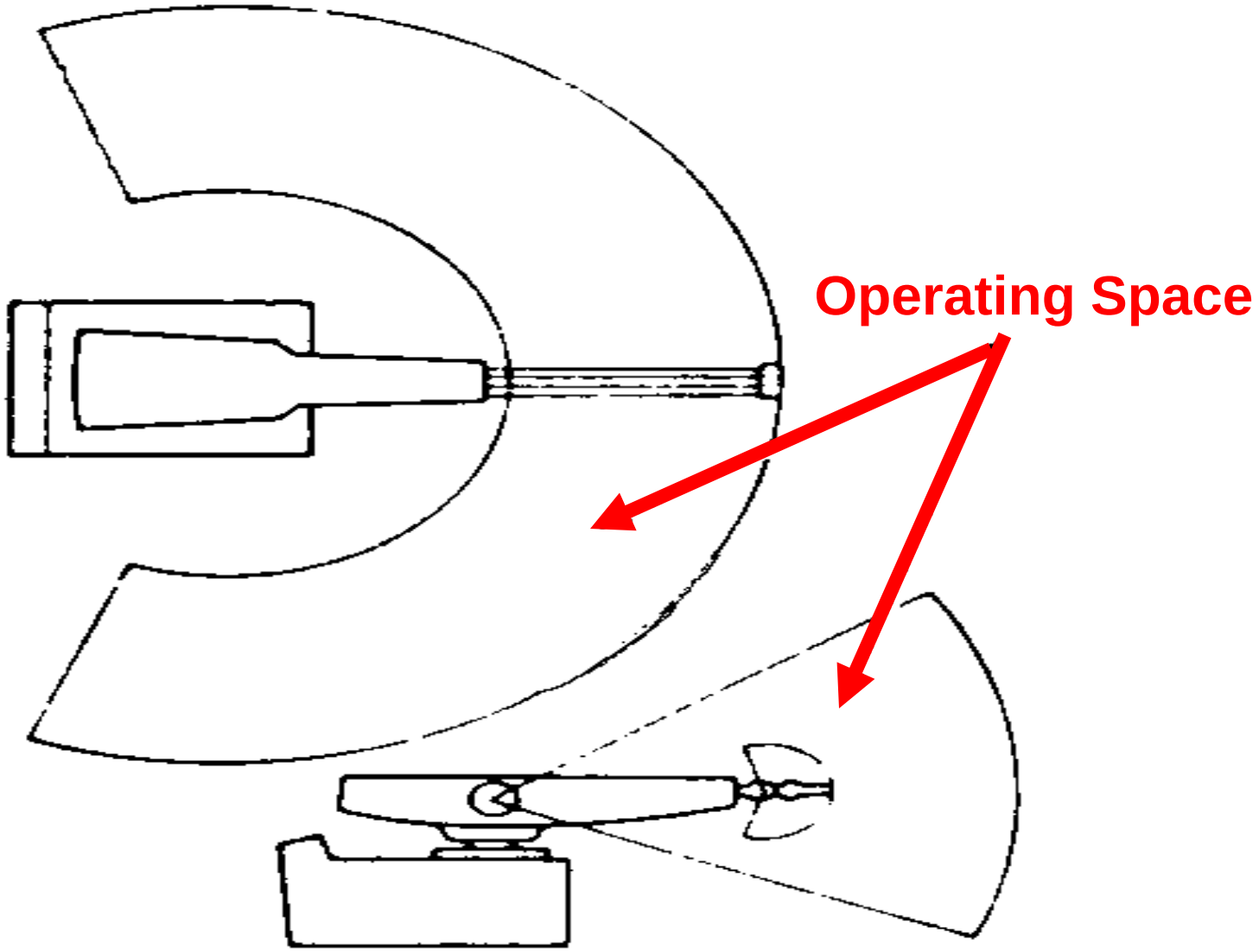
Definitions – Safeguarded Space

- The space defined by the perimeter safe guarding devices.

Space

Ohio Bureau of Workers' Compensation




Operating Space

Safeguarding Personnel from Hazards

- Moving Components
- Trapping or crushing
- Power sources
- Stored Energy
- Hazardous Materials
- Loose objects
- Vibration, shock
- Ergonomics
- Slips, trips and falls
- Moving, handling
- Protective failures
- Noise
- Inadvertent operation
- Human errors

Purpose of Safeguarding Devices

- Prevent access to the hazard
- Cause the hazard to cease before access
- Prevent unintended operation
- Contain parts and tooling
  - Loose objects, flying projectiles
- Control other process hazards
  - Noise, laser, radiation

Safeguarding Methodology

- Either follow the prescribed safeguarding requirements in chapter (8) OR do a comprehensive risk assessment per chapter (9)

- Detailed user requirements in chapter (10) of safeguarding device installation and use regardless if you use chapter (8) or (9)

Prescribed Method

- Passive safeguarding against hazards
- Establish restricted space
- Protection outside the safeguarded space
- Protection inside the safeguarded space
- Safeguard against point of operation hazards
- Clearance protection
- Control reliable circuitry required

Establish Restricted Space

- That portion of the maximum space to which a robot is restricted by limiting devices

- The maximum distance that the robot, end-effector, and the work piece can travel after a limiting device actuates defines the boundary of the robot's restricted space

Limiting Devices

- A device that restricts the maximum space by stopping or causing to stop all robot motion and is independent of the control program and the task programs
- Integral to robot or external mounting
- Mechanical or non-mechanical
- Stop robot at full rated load and speed

Barrier Guards

- Prevent access to a hazard
- Constructed to withstand operational and environmental forces
- Free of sharp edges and projections
- Not create a hazard in themselves
- Comply with opening size and distance from the hazard

Barrier Guards Fixed

- Bottom no more than 6 inches from floor.
- Top no lower than 1.5m above adjacent walking surface
- Require the use of tools to remove any fixed portion
- May not be positioned any closer than the restricted space

Barrier Guards Interlocked

- Open away from the hazard and not into the safeguard space
- Cannot close by itself and activate the interlocking circuitry
- Can not be easily defeated
- Must be able to open from the inside of the safe guarded space

Robot Teach & Verification

- Teach and verification distinctly separate actions
- Teach
  - Program or teach the robot
- Verification
  - Confirm the program taught

Robot Teach

- Specific safeguard guidelines to protect the teacher
- Reduce speed control at all times
- Single point of control
- Additional persons allowed
- Clearance from operating space

Program Verification

- High Speed Attended Program Verification (APV) allowed with specific enhanced safeguarding requirements
- Robot speeds selectable and controlled
- Single point of control
- One operator
- Clearance from restricted space

Clearance Requirements

- Teach (Manual reduced speed):
  - 18 inches minimum from operating space
- High Speed APV capability readily available:
  - 18 inches minimum from restricted space
- Prescribed safeguarding methodology used:
  - 18 inches minimum from restricted space
- If clearance is not provided
  - Additional safeguarding is required

Questions?