

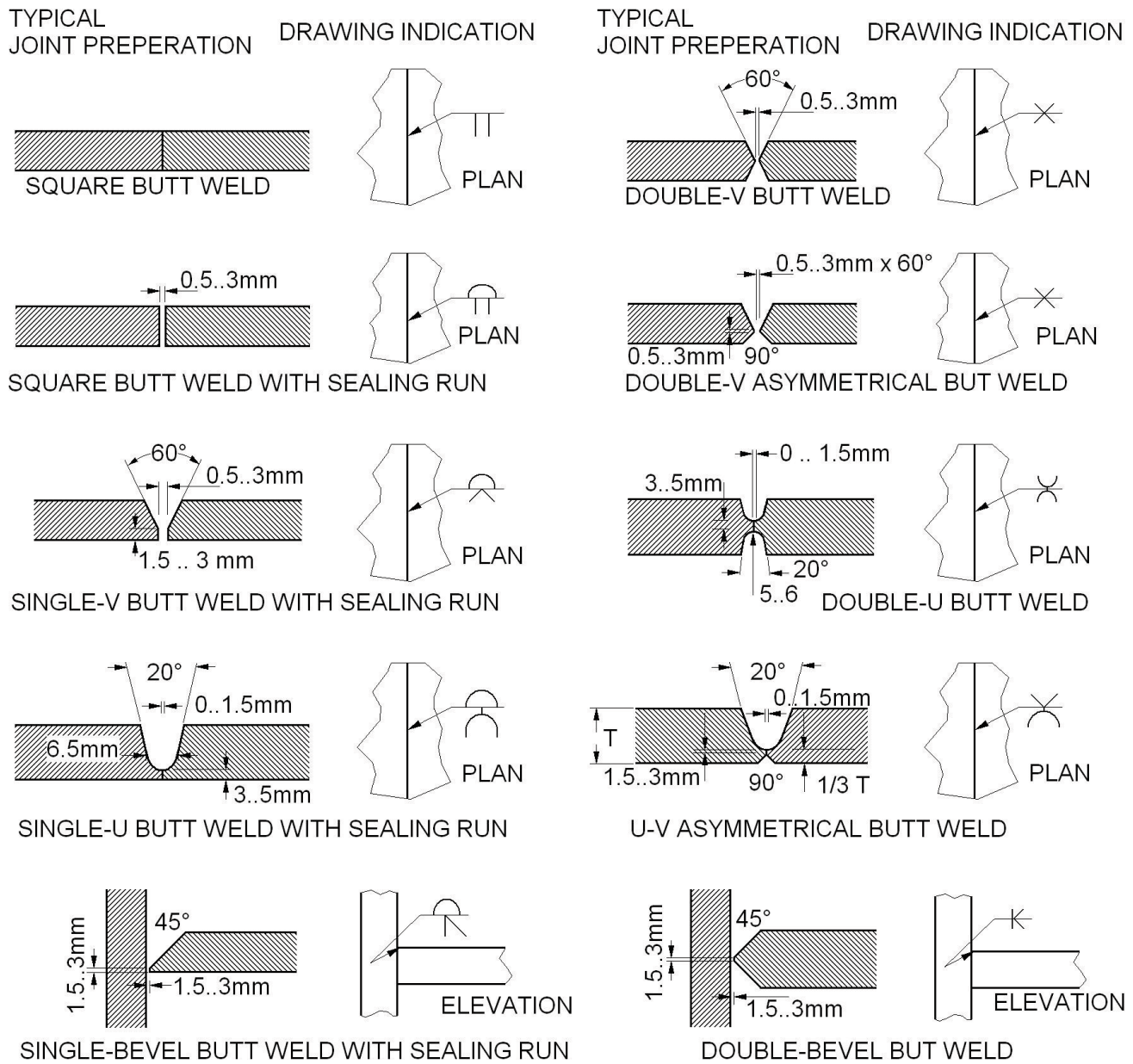
Engineering Weld Symbols

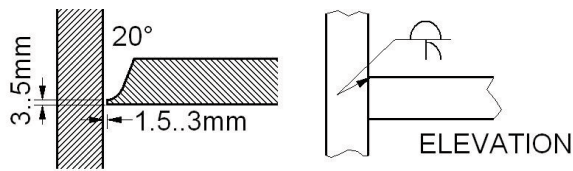
Working drawings present views of a workpiece in three ways:

- Plan
- Elevations
- Sections

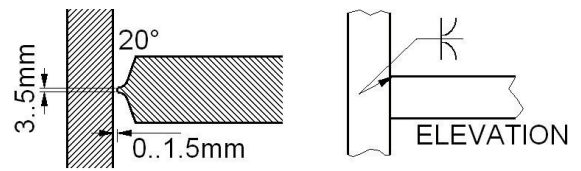
The plan view is as seen from above, looking down vertically. Elevations are side and/or end views. Sections are drawings on planes cut through the object.

Weld Symbols for Types of Joints

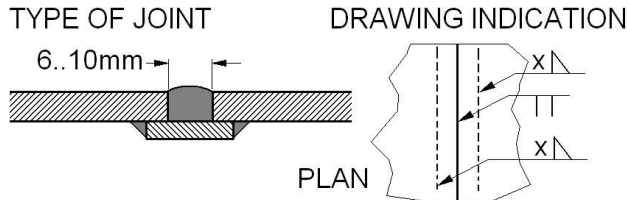




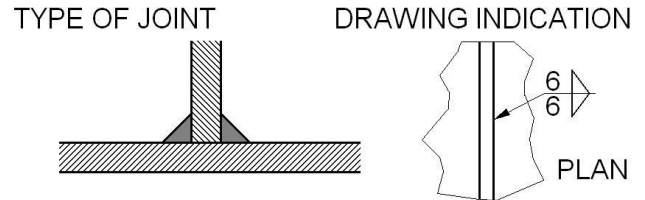
SINGLE-J BUTT WELD WITH SEALING RUN



DOUBLE-J BUTT WELD

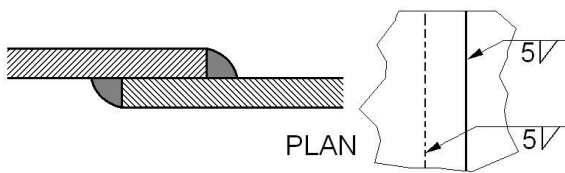


SQUARE BUTT WELD WITH PERMANENT BACKING STRIP HELD IN PLACE BY FILLET WELDS

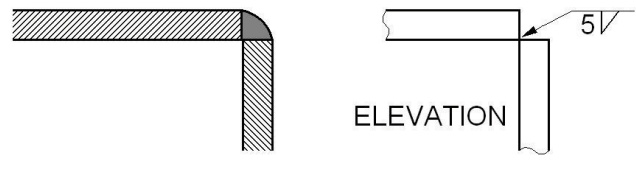


FILLET WELDED T-JOINT

To the left image: Structural member may also be used as a backing strip. To the right image: The leg length of the fillet weld required is stated at the left-hand side of the symbol.

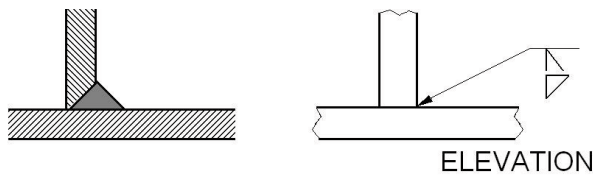


FILLET WELDED LAP JOINT

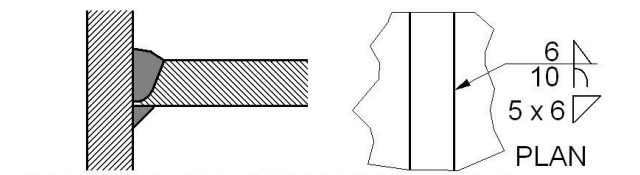


OUTSIDE CORNER JOINT

Unless otherwise indicated the leg length is the same as the plate thickness where plates are of equal thickness.

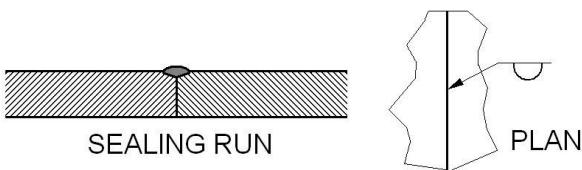


T-JOINT WITH FILLET WELD SUPERIMPOSED ON A SINGLE-BEVEL BUTT WELD



UNEQUAL LEG LENGTH FILLET WELD SUPERIMPOSED ON A PARTIAL PENETRATION SINGLE-J BUTT WELD WITH FILLET A ROOT

To the weld symbol of the T-joint: Both symbols are used, the butt-weld symbol being nearest to the reference line. The size of fillet weld is not stated unless it differs from that dictated by joint preparation.



SEALING RUN



SEALING RUN

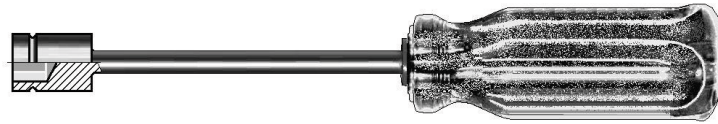
WELD ALL ROUND A JOINT, E.G: A FLANGE TO A PIPE; A STANCHION TO A BASE PLATE. A PERIPHAL WELD.

CONVEX FINISH (TO BUTT WELD)
CONCAVE FINISH (TO FILLET WELD)

WELD TO BE RADIOGRAPHED

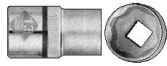
TO BE WELDED ON SITE

FLUSH FINISH TO BUTT WELD. SINGLE STRAIGHT LINE ADDED TO SYMBOL.



A **torque wrench** is a socket wrench drive tool that is employed to impart a precise amount of torque to a fastener, essential in many cases during the assembly of precision mechanisms.

SOCKET WRENCH

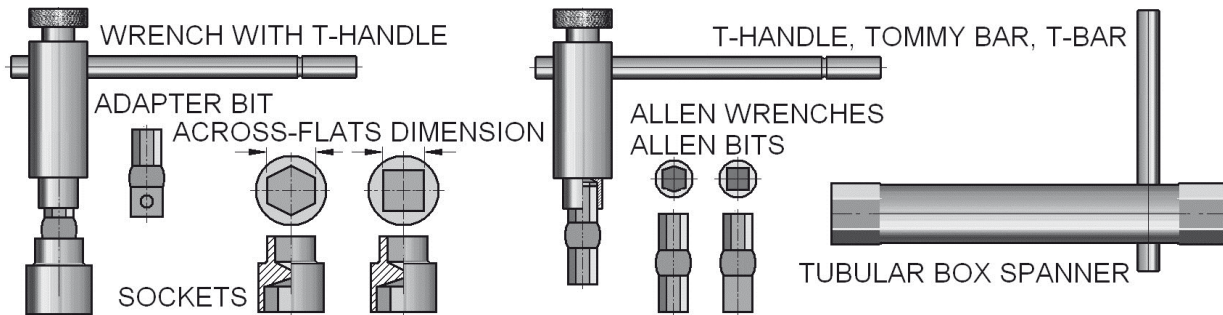


LEVER TO SWITCH SENSE OF ROTATION
TORQUE ADJUSTMENT



A **ratchet handle** contains a one-way mechanism which allows the socket or the bit to be turned without removing it from the nut or bolt simply by cycling the handle backward and forward. These sockets use for use where space restrictions preclude the use of a regular socket. Their principal use is with torque wrenches.

The following figure shows a **wrench sockets/bits set**, and a **tubular box spanner**. The set consists of a wrench with T-handle, an adapter bit, several sockets, and Allen bits. They are available in imperial, ANSI and metric measurements.

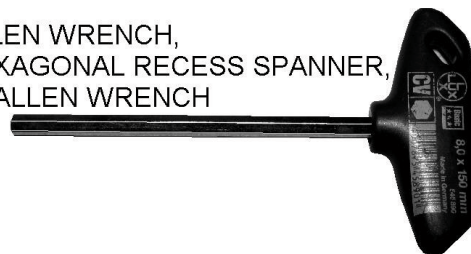


A **tubular box spanner** is a tube with six-sided sockets on both ends. It is turned with a short length of rod, called Tommy bar or T-bar, inserted through two holes in the tube.



TOE-STOP WRENCH

T-HANDLE ALLEN WRENCH,
T-HANDLE HEXAGONAL RECESS SPANNER,
HEAVY DUTY ALLEN WRENCH



Toe stop nut wrenches are used e.g. to mount skates. **Allen wrenches**, **Hex keys** or **Allen keys** are fabricated from hexagonal wire stock of various sizes, used to turn screw or bolt heads designed with a hexagonal recess to receive the wrench.

Methods of Mounting Workpieces

Clamping Workpieces to the Table

Before clamping a workpiece to the worktable of the milling machine, be sure that the table and the workpiece are free from dirt and burrs.

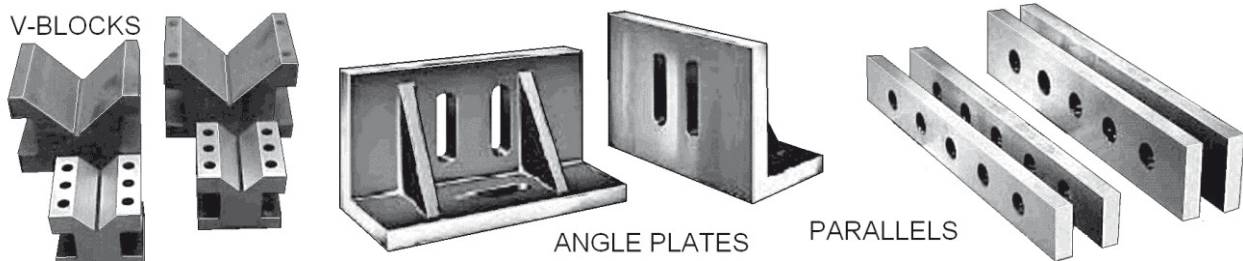
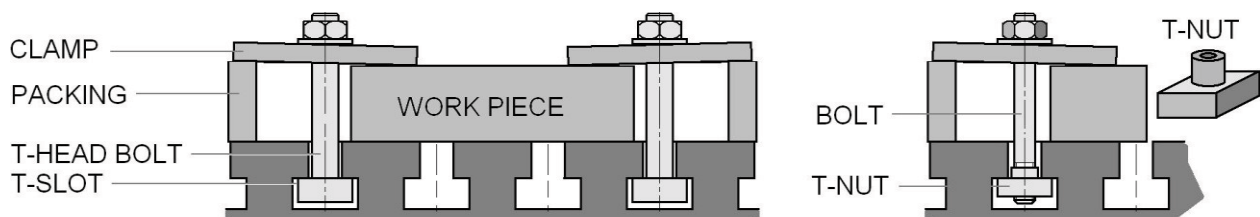
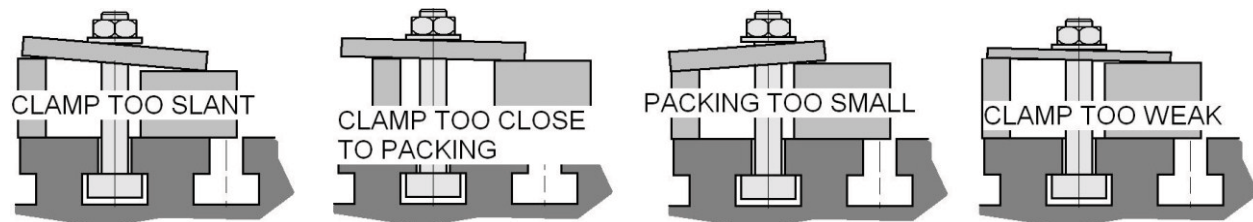


Figure above shows some helpful devices to clamp a workpiece to the milling table.

Clamp Workpieces having smooth machined surfaces directly to the table, provided the cutter does not come in contact with the table surface during milling.



If you have to clamp Workpieces with unfinished surfaces, protect the table face from damage by using a shim under the workpiece. Paper, plywood, and sheet metal are shim materials.

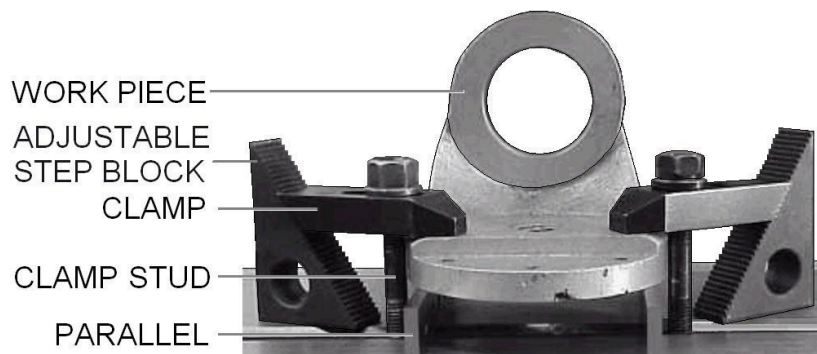


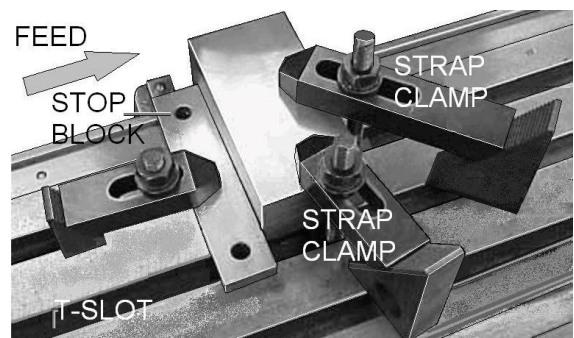
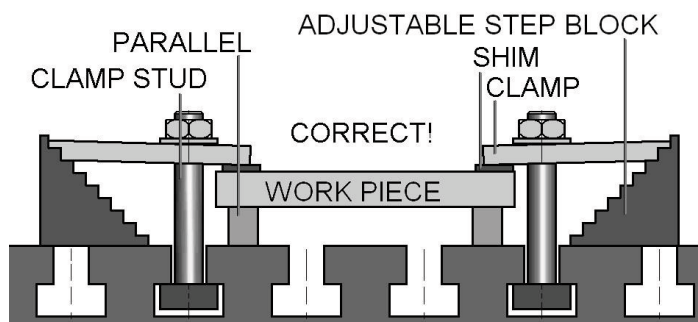
Locate clamps on both sides of the workpiece if possible to give a full bearing surface. These clamps are held by T-slot bolts inserted in the T-slots of the table.

Clamp supports must be the same height as the workpiece.

Never use clamp supports that are lower than the workpiece.

Adjustable step blocks are extremely useful to raise the clamps, as the height of the clamp bar can be adjusted to ensure maximum clamping pressure.





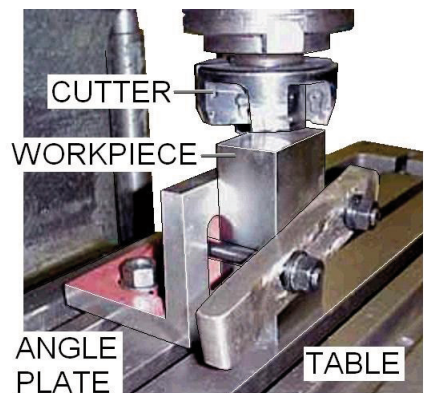
Clamping bolts should be placed as near to the workpiece as possible so that the full advantage of the fulcrum principle may be obtained.

When necessary to place a clamp on an overhanging part, provide a support between the overhang and the table to prevent springing or breaking.

Place a stop at the end of the workpiece where it will receive the thrust of the cutter when heavy cuts are taken.

Clamping a Workpiece to an Angle Plate

Workpieces clamped to an angle plate can be machined with surfaces parallel, perpendicular, or at an angle to a given surface. Angle plates are either adjustable or nonadjustable and are generally held in alignment by keys or tongues that fit into the table T-slots.

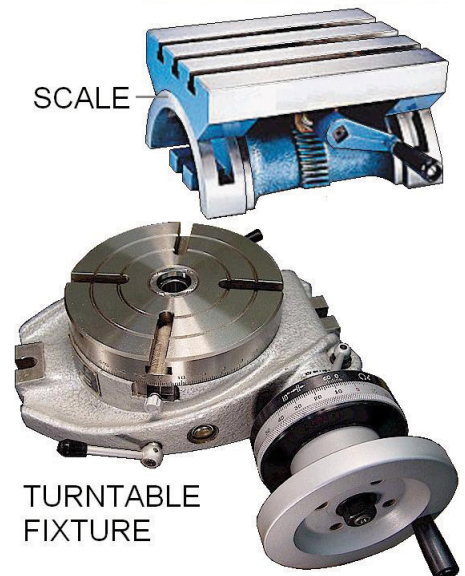


Clamping Workpieces in Fixtures

Fixtures also called mandrels are generally used in production work where a number of identical pieces are to be machined.

Holding Workpieces between Centers

You have to use an **indexing fixture** to support Workpieces which are centered on both ends. When the piece has been previously reamed or bored, you may it press upon a mandrel.

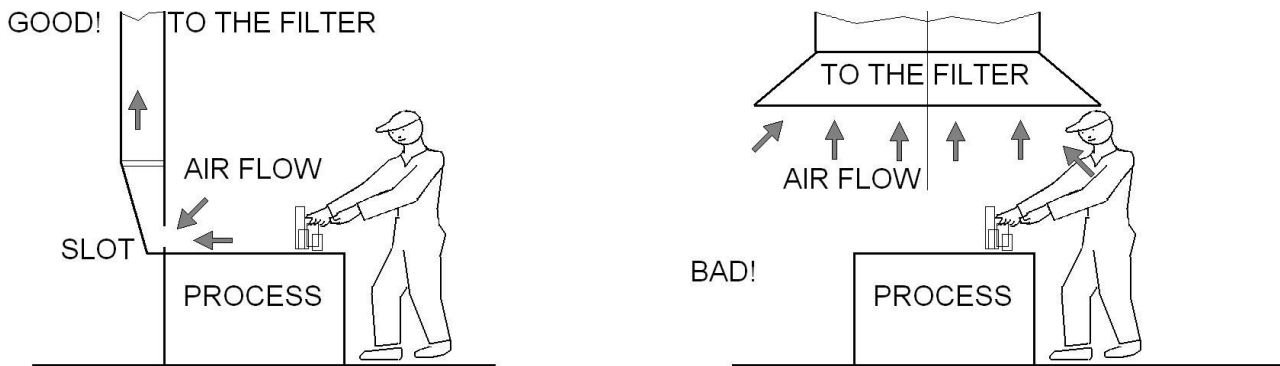


NOTE!



In metal working a **mandrel** or **mandril** is a tool component that grips or clamps workpieces to be machined. It is e.g. a bar of iron fitted to a turning lathe on which workpieces to be machined are fixed. Also the axle of a circular saw is called mandril.

Direction of Air Flow!



Good example: On the left side the air flows removed away from the breathing zone of the operator through a slot into the air cleaning system.

Bad example: On the right side, all the air from the working place is removed. There is more air removed than technically necessary. Additionally the polluted air violates the breathing zone of the operator!

NOTE!



Breathing zone is the area operators draw or expel air to or from the lungs.

Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or damages the natural environment, into the atmosphere.

Sufficient ventilation creates good **indoor air quality (IAQ)**. A lack of ventilation indoors concentrates air pollution where people often spend the majority of their time. It allows these airborne pollutants to accumulate more than they would otherwise occur in nature.

A **violation** is an intensely forcible action. Speeding (driving too fast) for example is a violation.

Air Cleaning Devices and Dust Collectors

Air cleaning devices remove contaminants from an air or gas stream. They are available in a wide range of designs to meet variations in air cleaning requirements. The quantity and characteristics of the contaminant to be removed and the conditions of the air stream will all have a bearing on the device selected for any given application.

In addition, fire safety and explosion control must be considered in all selections. Air cleaning devices are divided into basic groups: Air Filters and Dust collectors. Air filters are designed to remove low dust concentration of the magnitude found in atmospheric air.

They are typically used in ventilation, air-conditioning, and heating systems. There the dust concentrations seldom exceed 30 grains per thousand cubic meter of air. 15 000 grains are 1 kg approximately.

A typical atmospheric dust concentration of an urban area is 90 micrograms per cubic meter. Dust collectors are usually designed for the much heavier loads from industrial processes.

There the air to be cleaned originates in local exhausts systems or processes stack air effluents. Small, inexpensive versions of all categories of air cleaning devices are available. The principles of selection, application and operation are the same as for larger equipment.

The four major types of dust collectors for particulate contaminants are:

- Electrostatic Precipitators,
- Fabric Collectors,
- Wet Collectors, and
- Dry Centrifugal Collectors.

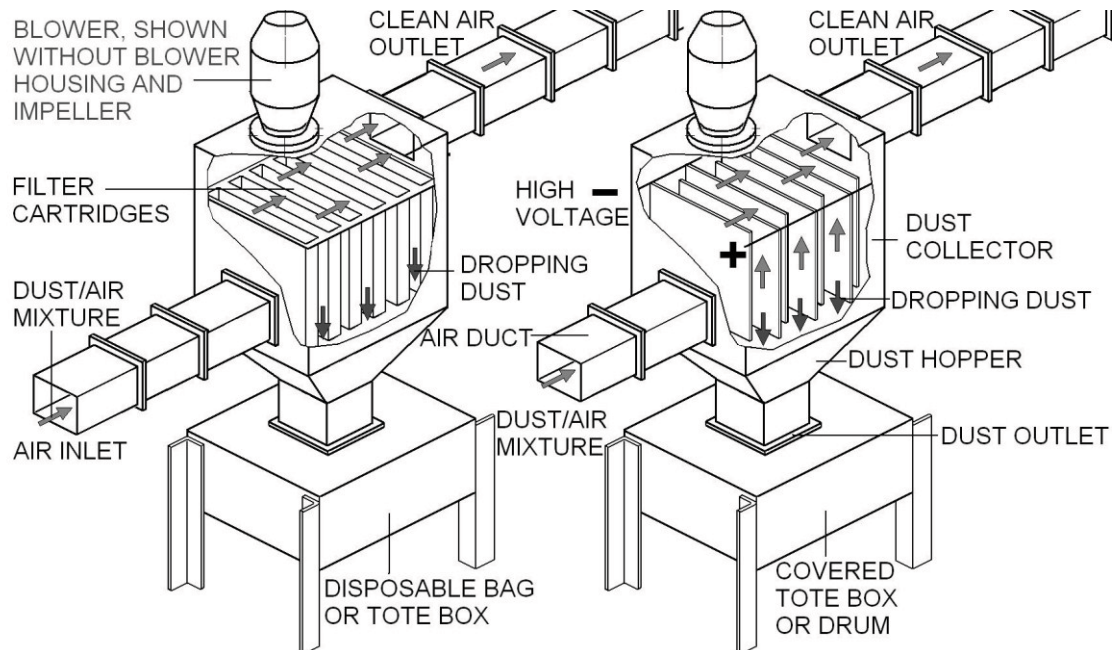


Figure above shows schematically on the left side a Fabric Collector, on the right side an Electrostatic Precipitator.



A **dust collector** is a cleaning device. It was designed to **strain particulate contaminants**. **Degree** is a graduation on a scale, or that which it measures.

A **given application** is the adequate use. **Magnitude** is another term for greatness, size, extend, or importance. An **urban area** is the area belonging to a city or town.

A **stack gas effluent** is the flowing out of polluted gas. **Inexpensive** is another term for cheap.

A **filter cartridge** is a device insert into a dust collector for filtering purpose. The filtered dust is either **disposable**, permitted to be thrown away, or **not disposable**, hazardous waste, not permitted to be thrown away.

Fabric collectors have woven filter cartridges. **Tote** is another term for carry, burden. A tote bag is a large bag for shopping. To **precipitate** means to come out of solution or suspension and settle as a solid deposit.