

# **PIPE FITTER TRAINING** MODULE

## **TOPICS**

### **1. PIPE FITTER MATHEMATICS**

**1.1 LINEAR MEASUREMENTS**

**1.2 CONVERSION OF UNITS**

**1.3 BASIC GEOMETRY**

**1.4 BASIC TRIGONOMETRIC/ SOLID MENSURATION**

**1.5 SOLVING FOR SIMPLE OFFSET 45 °**

**1.6 SOLVING FOR ROLLING OFFSET**

**1.7 SOLVING FOR 90° ELBOW L.R.**

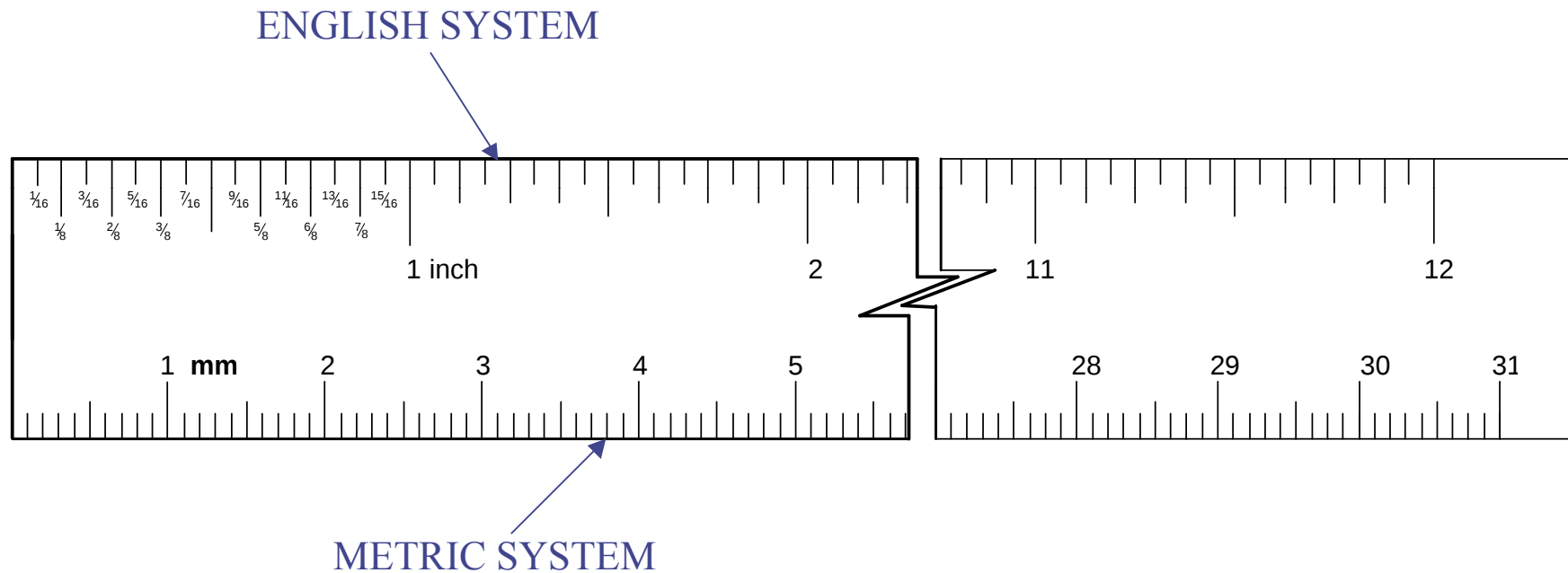
**1.8 SOLVING FOR 45° ELBOW**



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# 1.1 LINEAR MEASUREMENTS

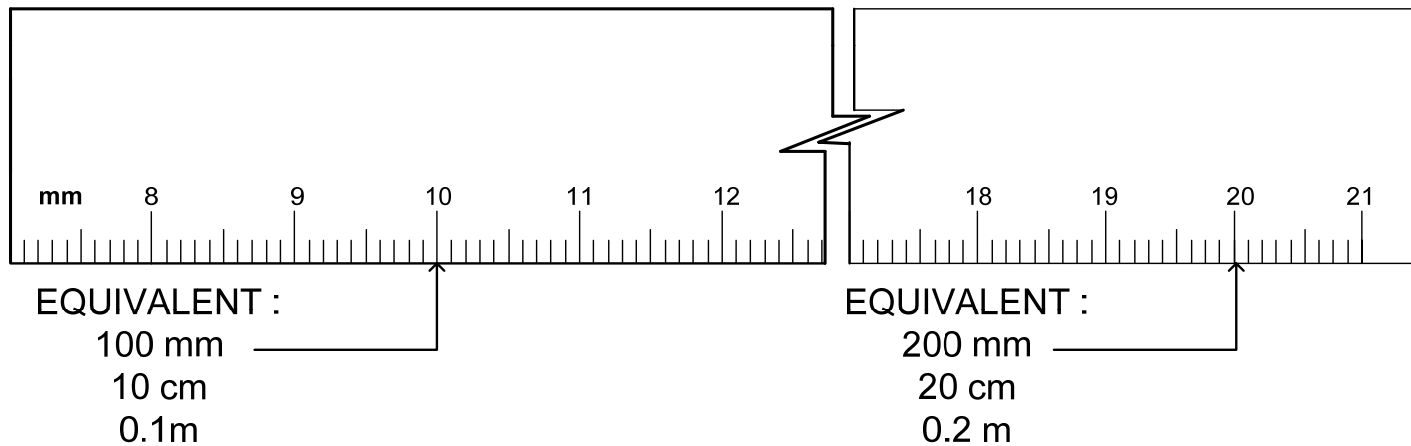
## STEEL TAPE ( METRO )



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# 1.1 LINEAR MEASUREMENTS

## STEEL TAPE ( METRO )



# 1.1 LINEAR MEASUREMENTS

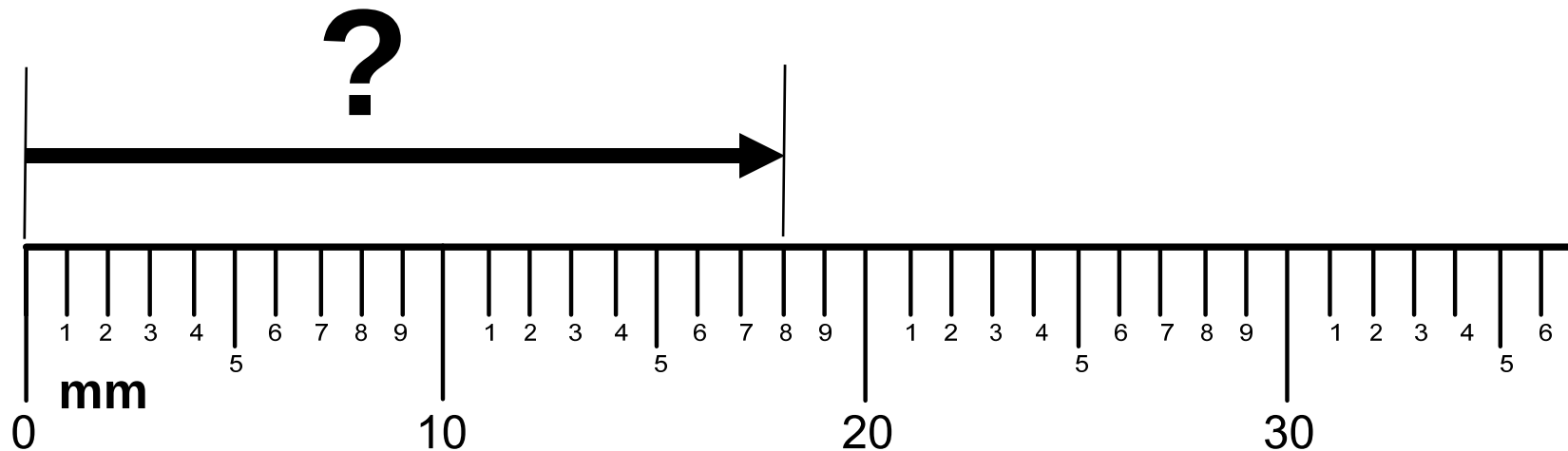
## METER TAPE READING

### METRIC SYSTEM

#### EXAMPLE 1

WHAT IS THE MEASUREMENT ?

ANSWER : 18 mm



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# 1.1 LINEAR MEASUREMENTS

## METER TAPE READING

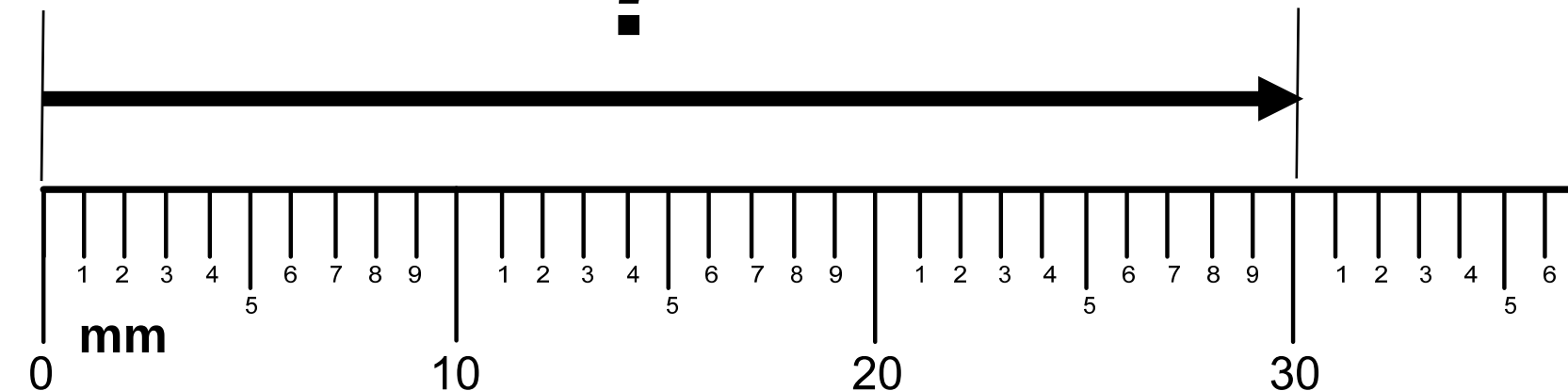
### METRIC SYSTEM

#### EXAMPLE 2

WHAT IS THE MEASUREMENT ?

ANSWER : 30 mm

?

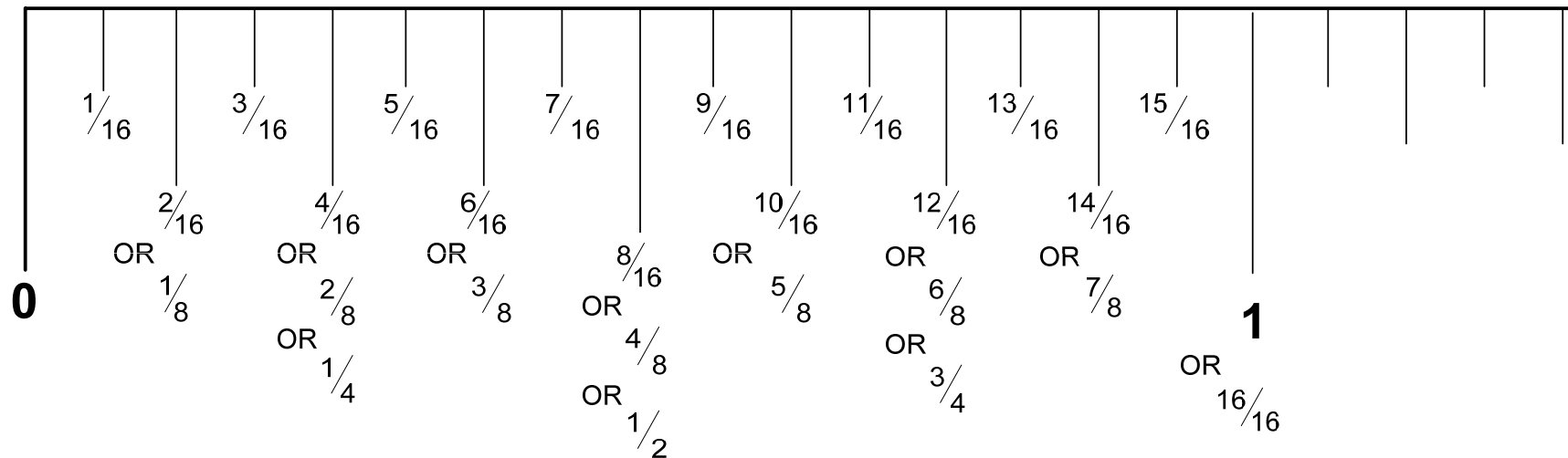


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# 1.1 LINEAR MEASUREMENTS

## METER TAPE READING

### ENGLISH SYSTEM



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# 1.1 LINEAR MEASUREMENTS

## METER TAPE READING

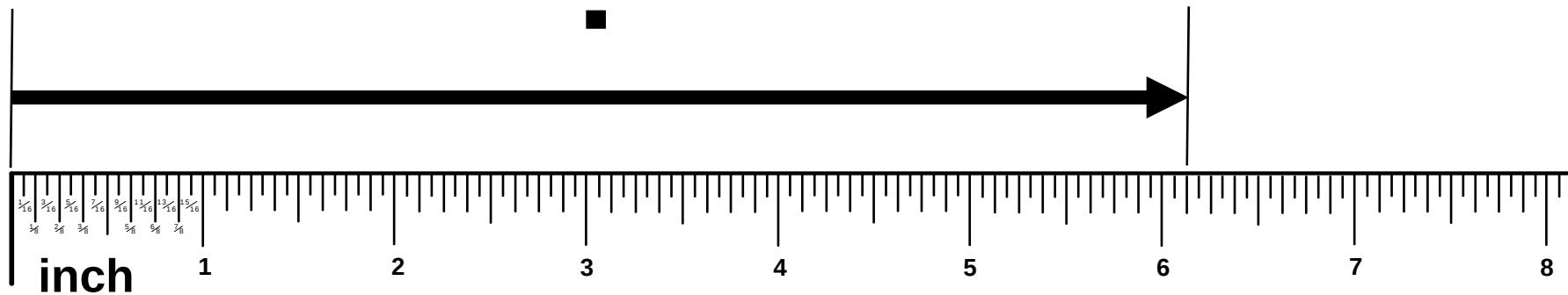
ENGLISH SYSTEM

WHAT IS THE MEASUREMENT ?

EXAMPLE 1

ANSWER : 6 1/8 in.

?



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# 1.1 LINEAR MEASUREMENTS

## METER TAPE READING

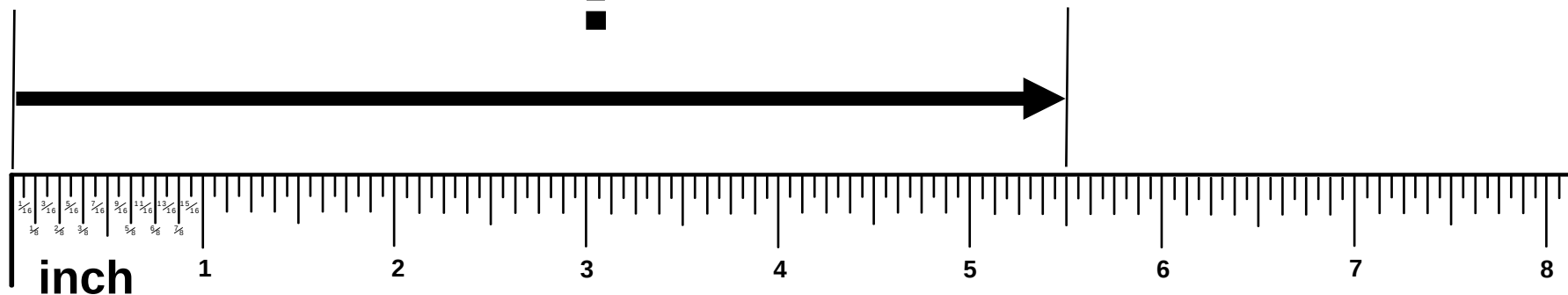
ENGLISH SYSTEM

WHAT IS THE MEASUREMENT ?

EXAMPLE 2

ANSWER : 5 1/2 in.

?



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## 1.2 CONVERSION OF UNITS

### CONVERSION FACTOR

1 Meter = 3.28 Feet

1 Meter = 39.37 Inches

1 Meter = 100 Centimeters

1 Meter = 1000 Millimeters

1 Foot = 12 Inches

1 Inch = 2.54 Centimeters

1 Centimeter = 10 Millimeters



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## 1.2 CONVERSION OF UNITS

|    | ENGLISH –<br>FRACTION (INCH) | ENGLISH –<br>DECIMAL (INCH) | ENGLISH –<br>(MILLIMETER) |
|----|------------------------------|-----------------------------|---------------------------|
| 1. | 1/16                         | 0.0625                      | 1.6                       |
| 2. | 1/8                          | 0.125                       | 3.2                       |
| 3. | 1/4                          | 0.25                        | 6.4                       |
| 4. | 3/8                          | 0.375                       | 9.8                       |
| 5. | 1/2                          | 0.50                        | 12.7                      |
| 6. | 5/8                          | 0.625                       | 16.0                      |
| 7. | 3/4                          | 0.75                        | 19.1                      |
| 8. | 7/8                          | 0.875                       | 22.2                      |
| 9. | 1                            | 1.0                         | 25.4                      |



## 1.2 CONVERSION OF UNITS

### CONVERSION FACTOR

#### SOLID

1 kilograms = 1000 grams = 2.2 pounds

1 ton = 1000 kilograms = 2200 pounds

#### LIQUID

1 gallon = 3.785 liters

#### PRESSURE

1 Kilopascals (kPa) = 6.894 pounds-force per inch (psi)



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## 1.2 CONVERSION OF UNITS

1. How many feet are there in 5 meters?

5 meters = \_\_\_\_\_ feet

$$5\text{ m} \times \frac{3.28\text{ feet}}{1\text{ m}} = 16.4\text{ feet}$$

2. How many meters are there in 15 feet?

15 feet = \_\_\_\_\_ meters

$$15\text{ feet} \times \frac{1\text{ m}}{3.28\text{ feet}} = 4.57\text{ m}$$



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## 1.2 CONVERSION OF UNITS

3. How many inches are there in 75 centimeters?  
75 centimeters = \_\_\_\_\_ inches

$$75 \text{ cm} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = 29.53 \text{ in}$$

4. How many centimeters are there in 100 inches?  
100 inches = \_\_\_\_\_ inches

$$100 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = 254 \text{ cm}$$



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## 1.2 CONVERSION OF UNITS

5. How many inches are there in 8 Meters?

8 Meters = \_\_\_\_\_ inches

$$8\text{ m} \times \frac{39.37\text{in}}{1\text{m}} = 314.96\text{in}$$

6. How many meters are there in 50 inches?

50 Inches = \_\_\_\_\_ meter

$$50\text{in} \times \frac{1\text{m}}{39.37\text{in}} = 1.27\text{ m}$$



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## 1.2 CONVERSION OF UNITS

7. How many centimeters are there in 50 meters?  
50 meters = \_\_\_\_\_ centimeters

$$50\text{ m} \times \frac{100\text{cm}}{1\text{m}} = 5,000\text{ cm}$$

8. How many meters are there in 250 centimeters?  
250 centimeters = \_\_\_\_\_ meters

$$250\text{ cm} \times \frac{1\text{m}}{100\text{cm}} = 2.50\text{m}$$



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## 1.2 CONVERSION OF UNITS

9. How many millimeters are there in 10 meters?

10 meters = \_\_\_\_\_ millimeters

$$10\text{ m} \times \frac{1000\text{mm}}{1\text{m}} = 10,000\text{ mm}$$

10. How many meters are there in 100 millimeters?

100 millimeters = \_\_\_\_\_ meters

$$100\text{mm} \times \frac{1\text{m}}{1000\text{mm}} = 0.10\text{m}$$



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## 1.2 CONVERSION OF UNITS

11. How many inches are there in 3 feet?

3 feet = \_\_\_\_\_ inches

$$3 \text{ ft} \times \frac{12 \text{ in}}{1 \text{ ft}} = 36 \text{ in.}$$

12. How many feet are there in 48 inches?

48 inches = \_\_\_\_\_ feet

$$48 \text{ in} \times \frac{1 \text{ ft}}{12 \text{ in}} = 4 \text{ ft.}$$



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## 1.2 CONVERSION OF UNITS

13. How many millimeters are there in 3 centimeters?

3 centimeters = \_\_\_\_\_ millimeters

$$3 \text{ cm} \times \frac{10\text{mm}}{1\text{cm}} = 30\text{mm}$$

14. How many centimeters are there in 50 millimeters?

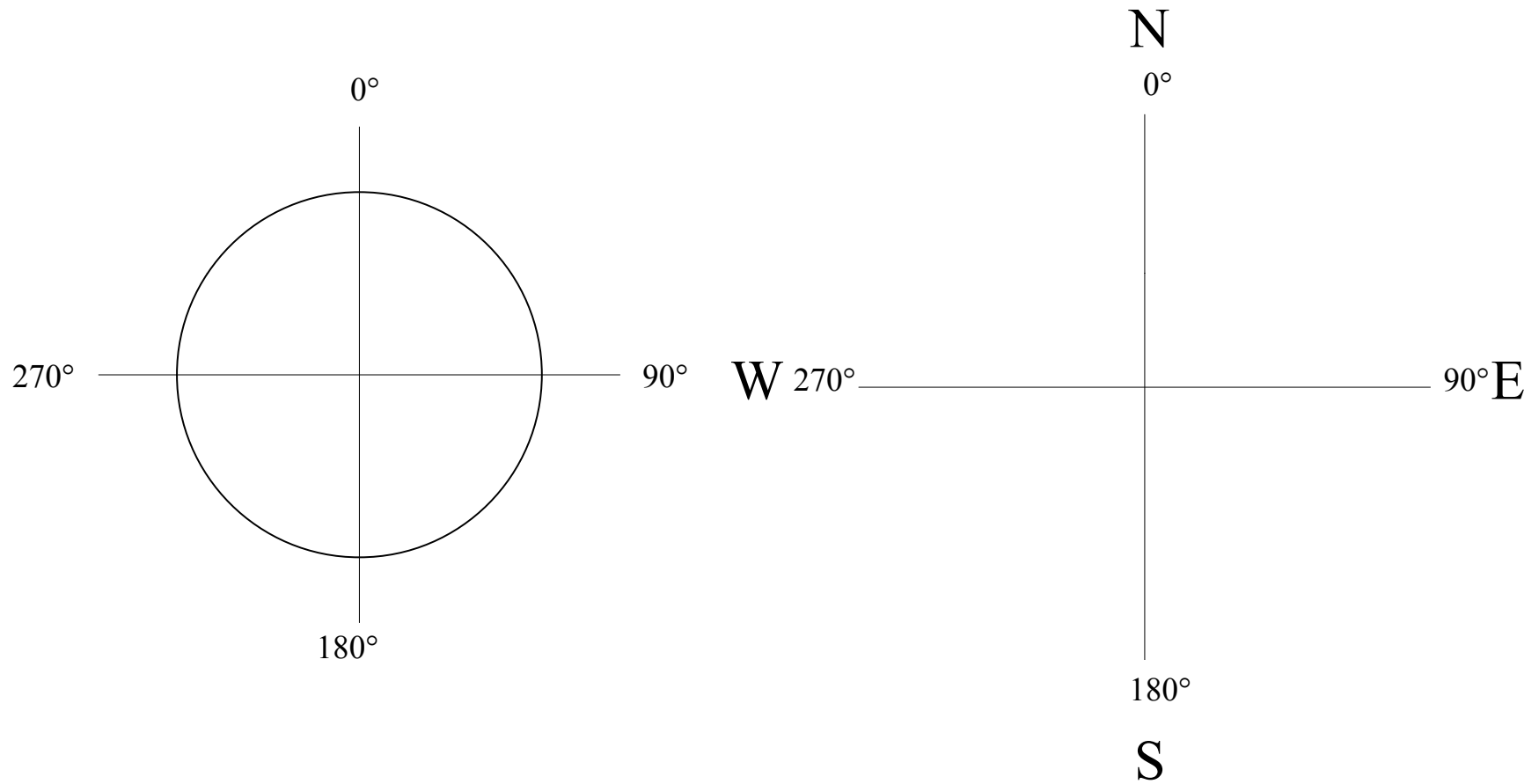
50 millimeters = \_\_\_\_\_ centimeters

$$50 \text{ mm} \times \frac{1\text{cm}}{10\text{mm}} = 5\text{cm}$$



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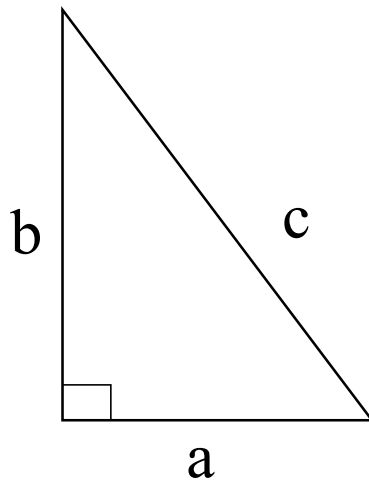
## 1.3 BASIC GEOMETRY



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## 1.4 BASIC TRIGONOMETRIC/ SOLID MENSURATION

### BASIC TRIGONOMETRIC FUNCTION



$$c^2 = a^2 + b^2$$

$$a^2 = c^2 - b^2$$

$$b^2 = c^2 - a^2$$

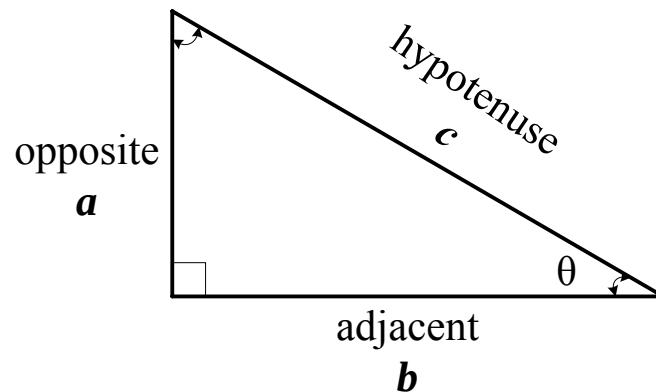
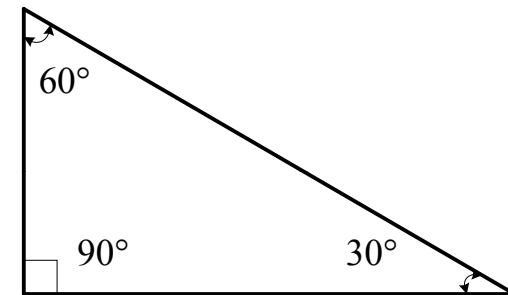
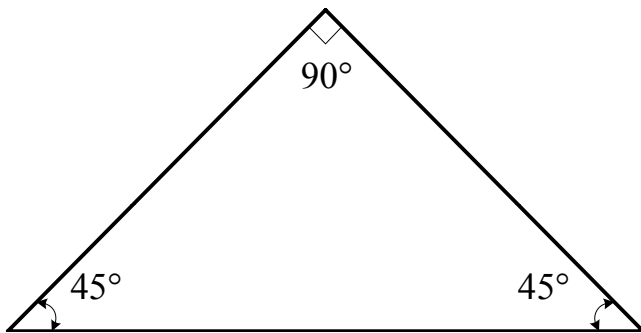
$$c = \sqrt{a^2 + b^2}$$

$$a = \sqrt{c^2 - b^2}$$

$$b = \sqrt{c^2 - a^2}$$

# 1.4 BASIC TRIGONOMETRIC/ SOLID MENSURATION

## BASIC TRIGONOMETRIC FUNCTION



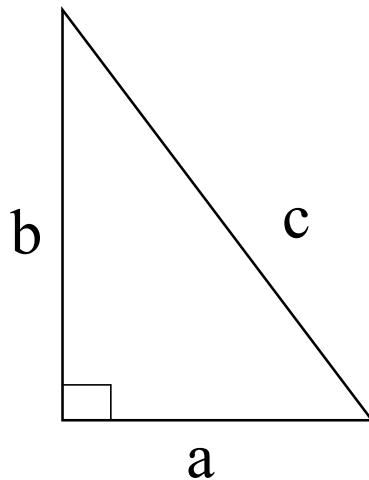
$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{a}{c}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{b}{c}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}} = \frac{a}{b}$$

## 1.4 BASIC TRIGONOMETRIC/ SOLID MENSURATION

### BASIC TRIGONOMETRIC FUNCTION



$$c^2 = a^2 + b^2$$

$$a^2 = c^2 - b^2$$

$$b^2 = c^2 - a^2$$

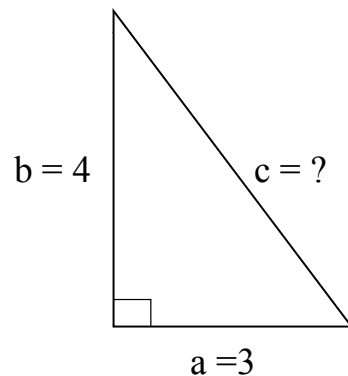
$$c = \sqrt{a^2 + b^2}$$

$$a = \sqrt{c^2 - b^2}$$

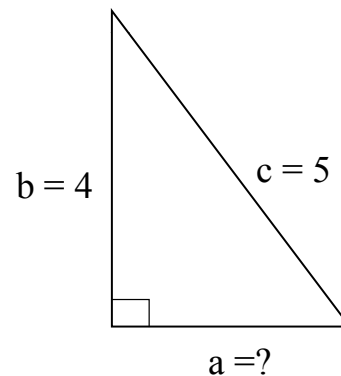
$$b = \sqrt{c^2 - a^2}$$

# 1.4 BASIC TRIGONOMETRIC/ SOLID MENSURATION

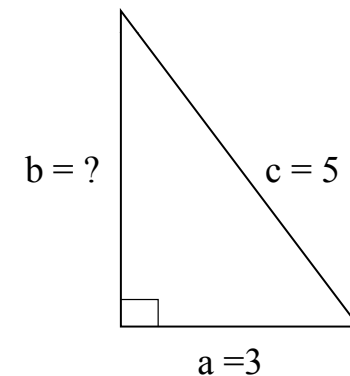
## BASIC TRIGONOMETRIC FUNCTION



$$c^2 = a^2 + b^2$$
$$c^2 = 3^2 + 4^2$$
$$c = \sqrt{3^2 + 4^2} = 5$$



$$a^2 = c^2 - b^2$$
$$a^2 = 5^2 - 4^2$$
$$a = \sqrt{5^2 - 4^2} = 3$$



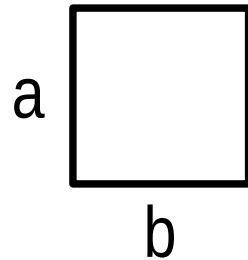
$$b^2 = c^2 - a^2$$
$$b^2 = 5^2 - 3^2$$
$$b = \sqrt{5^2 - 3^2} = 4$$



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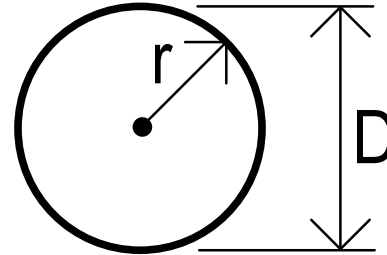
## 1.4 BASIC TRIGONOMETRIC/ SOLID MENSURATION

### PERIMETER



$$P = 2a + 2b$$

**Square**

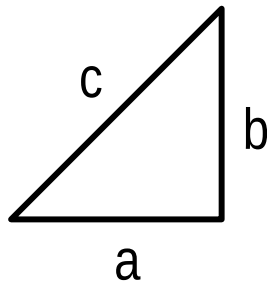


$$P = (\pi) D$$

$$P = 2(\pi) r$$

$$\pi = 3.1416$$

**Circle**

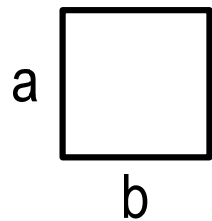


$$P = a + b + c$$

**Triangle**

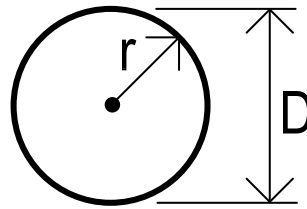
## 1.4 BASIC TRIGONOMETRIC/ SOLID MENSURATION

### AREA



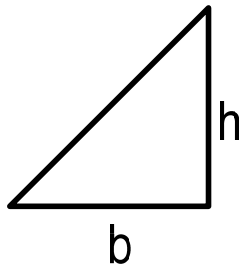
$$A = a \times b$$

**Square**



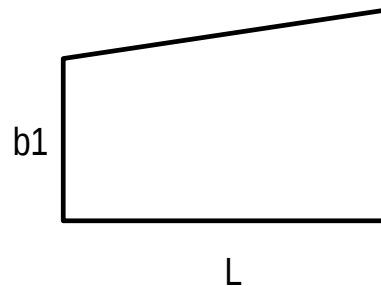
$$A = \frac{\pi (D \times D)}{4}$$
$$\pi = 3.1416$$

**Circle**



$$A = \frac{1}{2} b h$$

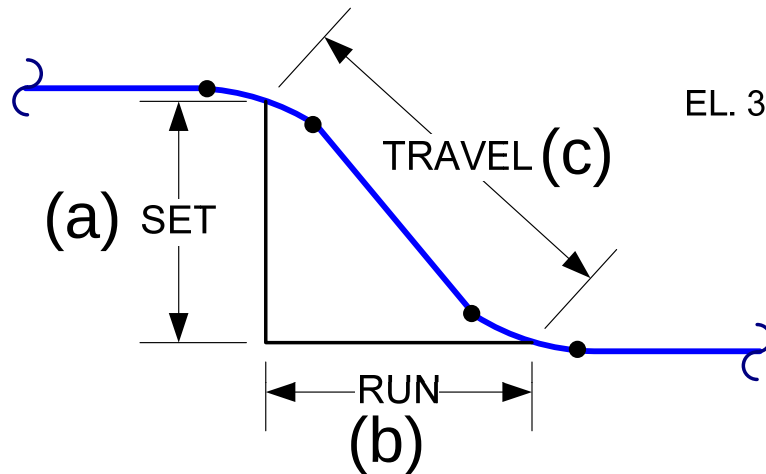
**Triangle**



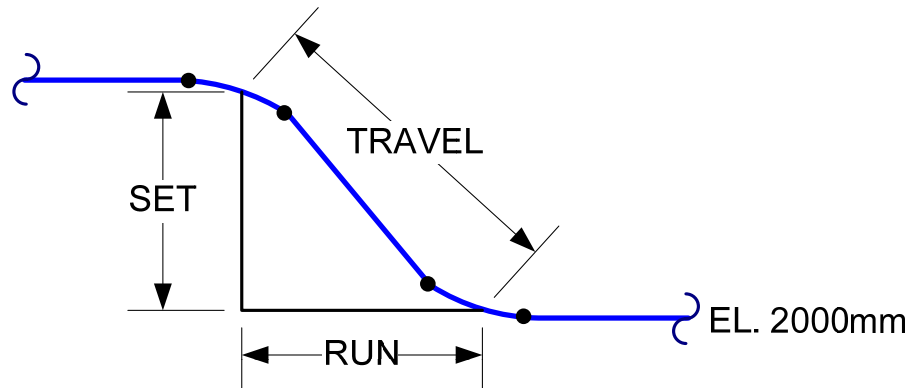
$$A = \frac{1}{2} (b1 + b2) L$$

**Trapezoid**

## 1.5 SOLVING FOR SIMPLE OFFSET 45 °



EL. 3000mm



**FORMULA :**

$$C = \sqrt{a^2 + b^2}$$

**FOR 45 DEG. ELBOW:  
SET = RUN**

$$\begin{aligned} C &= \sqrt{a^2 + b^2} \\ &= \sqrt{(1000)^2 + (1000)^2} \\ &= \sqrt{2000000} \\ &= 1414.21 \text{ mm} \end{aligned}$$



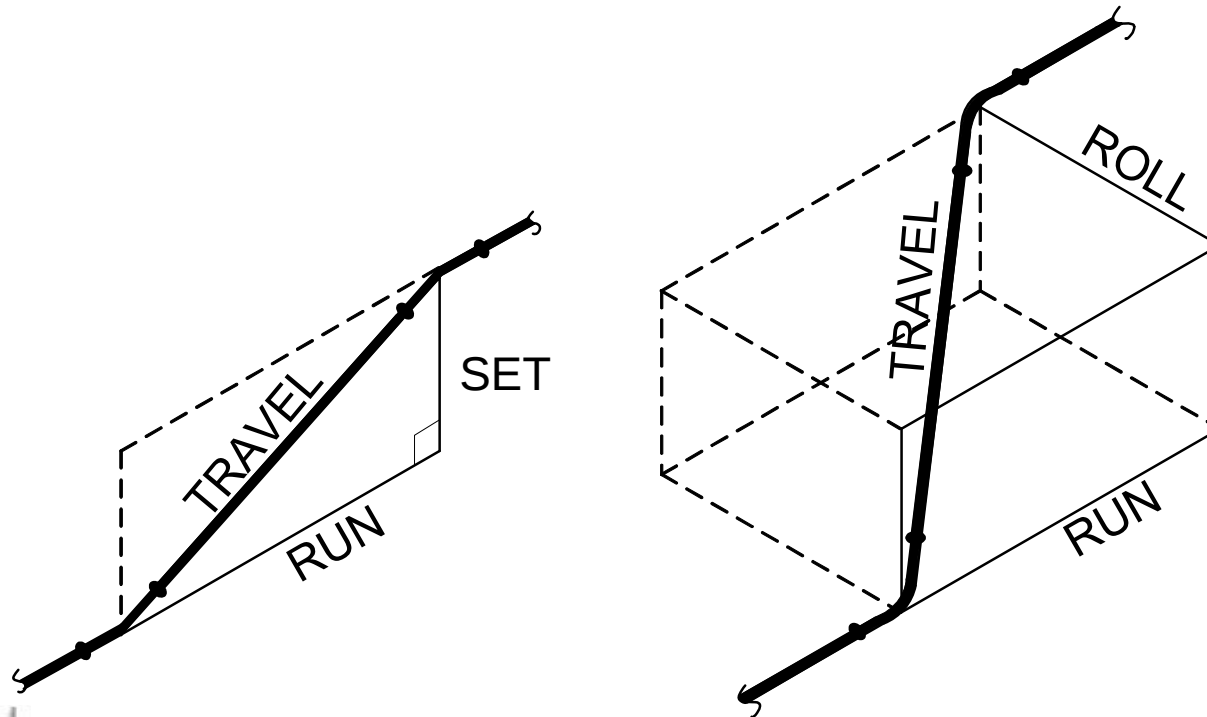
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# 1.6 SOLVING FOR ROLLING OFFSET

## SOLVING ROLLING OFFSETS:

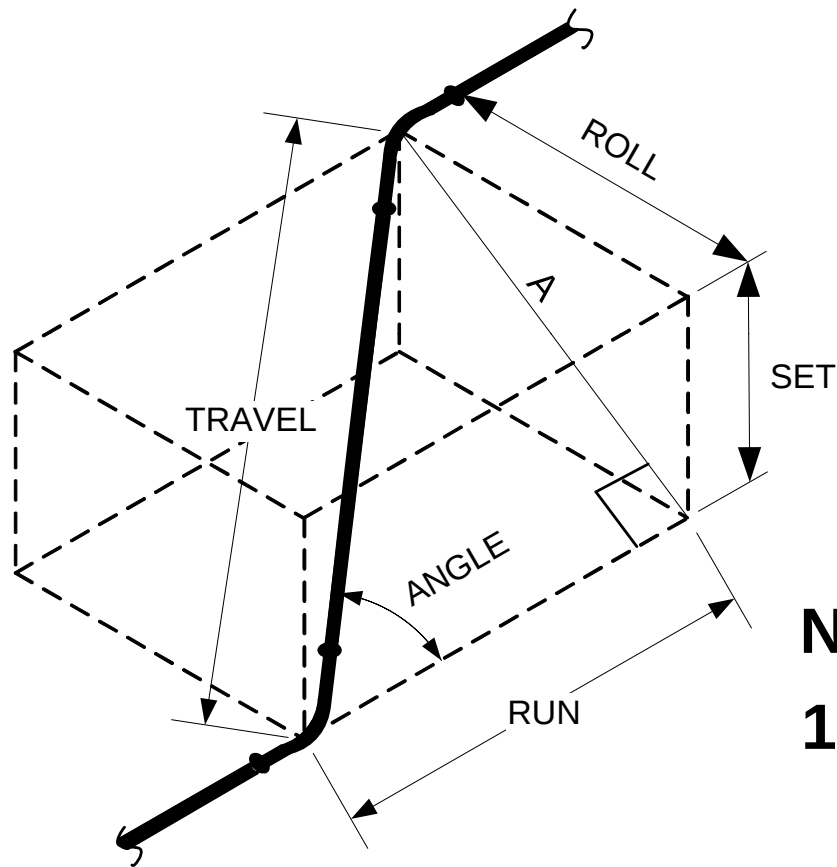
### INTRODUCTION:

A ROLLING OFFSET CAN BE FIGURED JUST LIKE A SIMPLE OFFSET WHICH IS ROLLED OVER TO FORM A DISTANCE CALLED "ROLL". THIS IDEA IS VERY USEFUL IN DETERMINING THE NUMBER OF DEGREES OF THE BEND OR ELBOW TO BE USED.



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## 1.6 SOLVING FOR ROLLING OFFSET



**FORMULA :**

$$A = \sqrt{\text{ROLL}^2 + \text{SET}^2}$$

$$\text{TRAVEL} = A \times 1.414$$

$$\text{RUN} = A \times 1$$

**NOTE :**

**1.414 = cosecant of angle of 45 ° fitting**

**1 = cotangent of angle of 45 ° fitting**



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## 1.6 SOLVING FOR ROLLING OFFSET

### EXAMPLE :

The roll of a 45 ° offset is 8 in. and the set is 15 in. Find the length of the travel and run.

### FORMULA :

$$A = \sqrt{\text{ROLL}^2 + \text{SET}^2}$$

$$A = \sqrt{8^2 + 15^2} = 17 \text{ in.}$$

$$\text{TRAVEL} = A \times 1.414$$

$$\text{TRAVEL} = 17 \times 1.414 = 24 \frac{1}{32} \text{ in.}$$

$$\text{RUN} = A \times 1$$

$$\text{RUN} = 17 \times 1 = 17 \text{ in.}$$

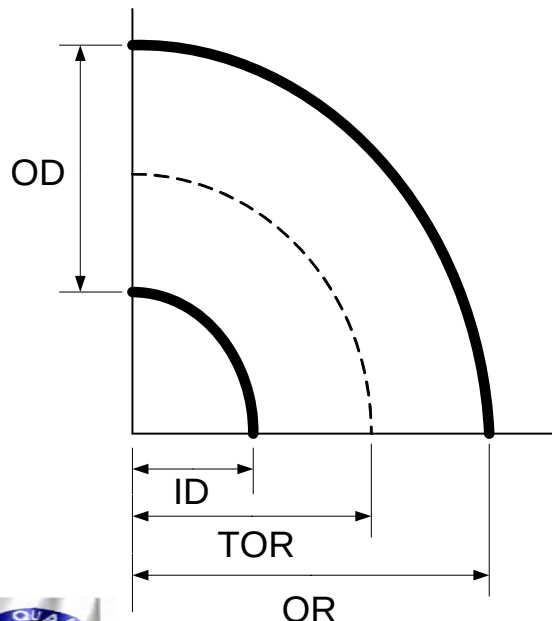


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## 1.7 SOLVING FOR TAKE-OFF ELBOW L.R.

WHEN THE REQUIRED BEND FOR SIMPLE OR ROLLING OFFSET IS NOT AVAILABLE, IT CAN BE FABRICATED FROM A 90° LONG RADIUS WELD ELBOWS. TO FABRICATE CUT-ELBOW (FROM 90° LR ELBOW). THE FOLLOWING PROCEDURE CAN BE USEFUL.

- I. KNOW THE ACTUAL O.D. OF THE PIPE OR FITTING USED. REMEMBER THAT NOMINAL PIPE SIZES 12" Ø AND BELOW HAVE THEIR DESIGNATED O.D.'s.
- II. DETERMINE THE TAKE OFF RADIUS (TOR) OF THE 90° LR ELBOW USED AND CALCULATE THE INSIDE AND OUTSIDE RADII.



WHERE: OD = OUTSIDE DIAMETER  
IR = INSIDE RADIUS =  $TOR - (\frac{1}{2} OD)$   
OR = OUTSIDE RADIUS =  $TOR + (\frac{1}{2} OD)$   
TOR = TAKE OFF RADIUS =  $1.5 \times D$  (NPS)

## 1.7 SOLVING FOR 90° ELBOW L.R.

### FORMULA FOR TAKE-OFF ELBOW – L.R.

#### 1. 90° ELBOW – LONG RADIUS

A. ENGLISH SYSTEM USE – 1.5

A. EXAMPLE : SIZE OF PIPE=8"

8"

$$\begin{array}{r} \text{X } 1.5 \text{ ENGLISH} \\ \hline \mathbf{12.00''} \end{array}$$

B. METRIC SYSTEM USE - 38.1

B. EXAMPLE : SIZE OF PIPE=8"

8"

$$\begin{array}{r} \text{X } 38.1 \text{ METRIC} \\ \hline \mathbf{304.8 \text{ mm.}} \end{array}$$

#### •CHECKING:

IN ENGLISH SYSTEM A = B

$$12'' = \frac{304.8}{25.4}$$

$$12'' = 12''$$

IN ENGLISH SYSTEM A = B

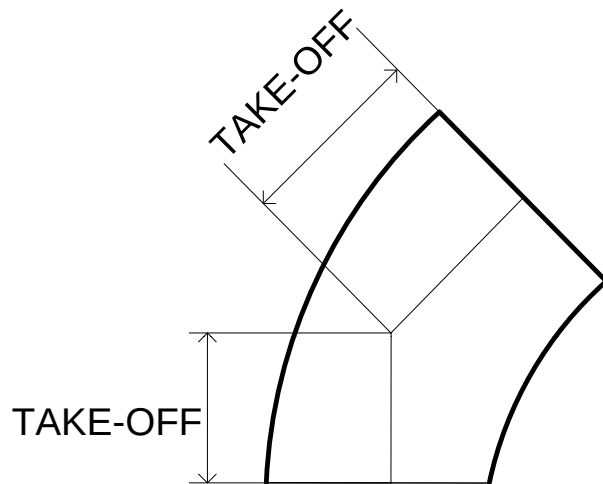
$$12'' \times \frac{25.4 \text{ mm}}{1''} = 304.8 \text{ mm}$$

$$304.8 \text{ mm} = 304.8 \text{ mm}$$



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# 1.8 SOLVING FOR 45° ELBOW



## 45° ELBOW

A. ENGLISH SYTEM : USE 0.625" ( INCH) = USE ALL SIZE OF PIPE)

B. METRIC SYSTEM : USE 15.875 (mm) USE ALL SIZE OF PIPE

EXAMPLE :

ENGLISH SYSTEM

8 " SIZE OF PIPE

$$\begin{array}{r} \text{X } 0.625 \\ \hline 5" \end{array}$$

METRIC SYSTEM

8 " SIZE OF PIPE

$$\begin{array}{r} \text{X } 15.875 \\ \hline \mathbf{127 \text{ mm}} \end{array}$$

## FORMULA :

DIAMETER X0.625 (ENGLISH)

DIAMETER X15.875 (METRIC)

EXAMPLE

0.625 ENGLISH SYSTEM

$$\begin{array}{r} \text{x } 25.4 \\ \hline \end{array}$$

**15.875** METRIC SYSTEM

NOTE: DIAMETER IS NOMINAL PIPE SIZE



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# **PIPE FITTER TRAINING MODULE**

## **TOPICS**

### **2. BLUE PRINT READING**

#### **2.1 ORTHOGRAPHIC DRAWINGS (PLANS, ELEVATION, & SECTION)**

#### **2.2 ISOMETRIC DRAWINGS & DETAILS**



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## 2.1 ORTHOGRAPHIC DRAWINGS (PLANS, ELEVATION, & SECTION)

### Line Types



Continuous Line



Hidden Line



Center Line



Dimension Line

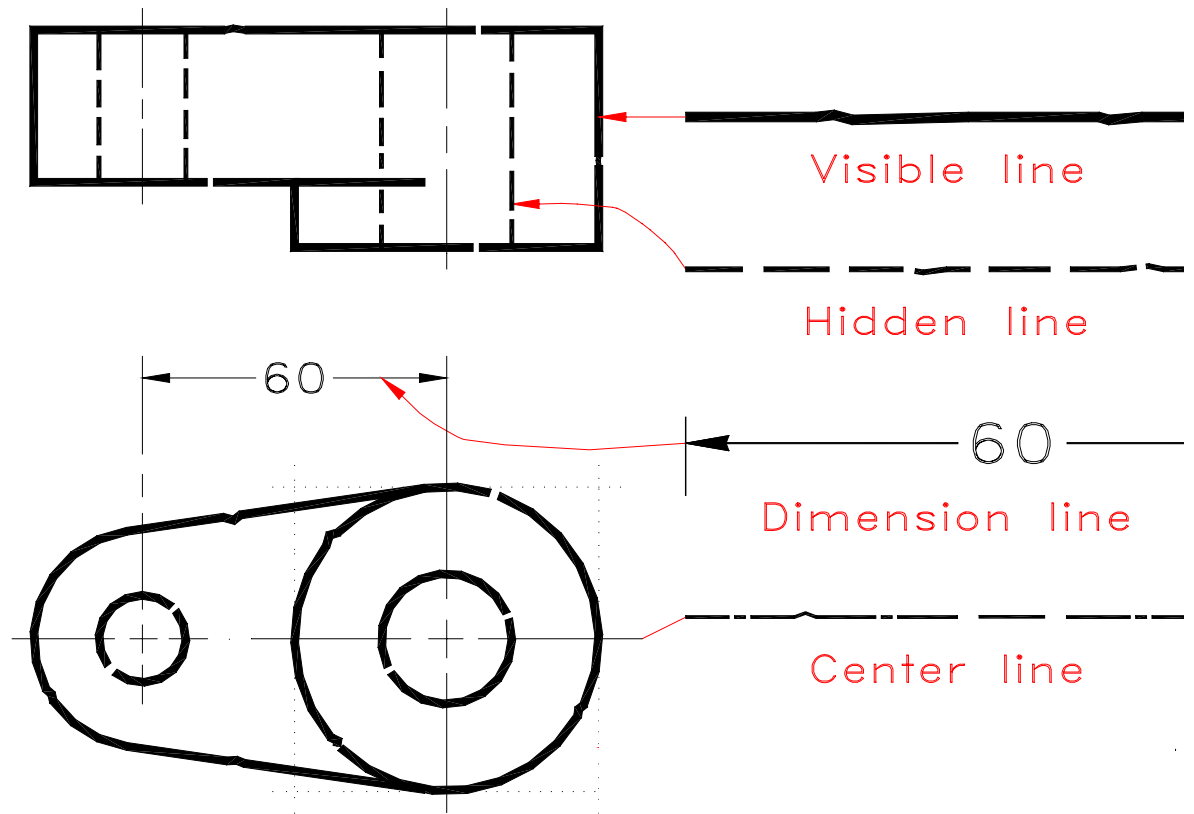


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## 2.1 ORTHOGRAPHIC DRAWINGS (PLANS, ELEVATION, & SECTION)

### Linetypes

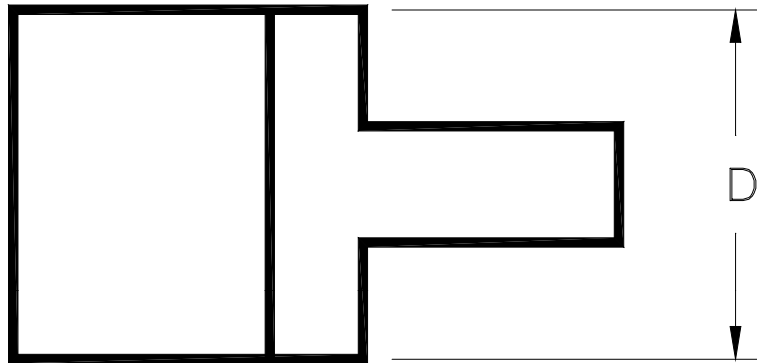
- Visible
- Hidden
- Center



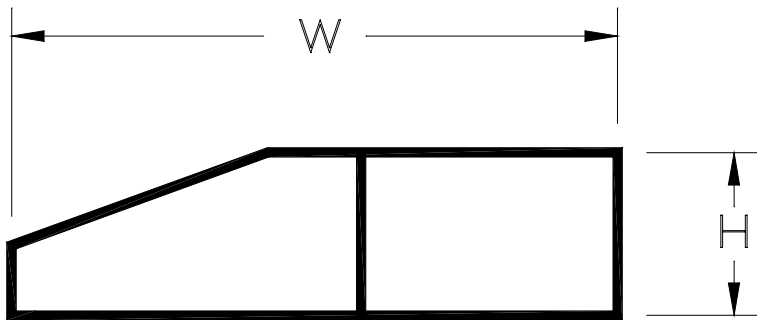
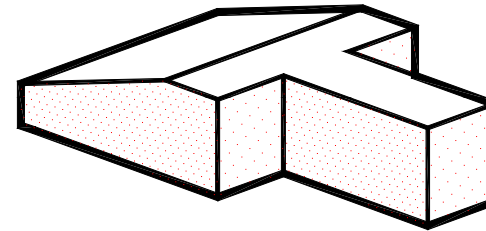
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## 2.1 ORTHOGRAPHIC DRAWINGS (PLANS, ELEVATION, & SECTION)

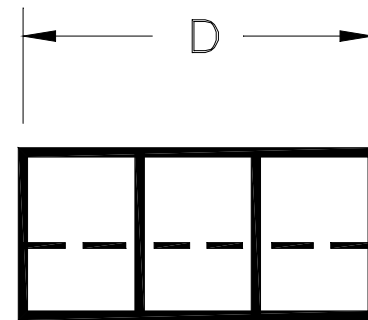
Three Primary Views



TOP VIEW



FRONT VIEW



R SIDE V

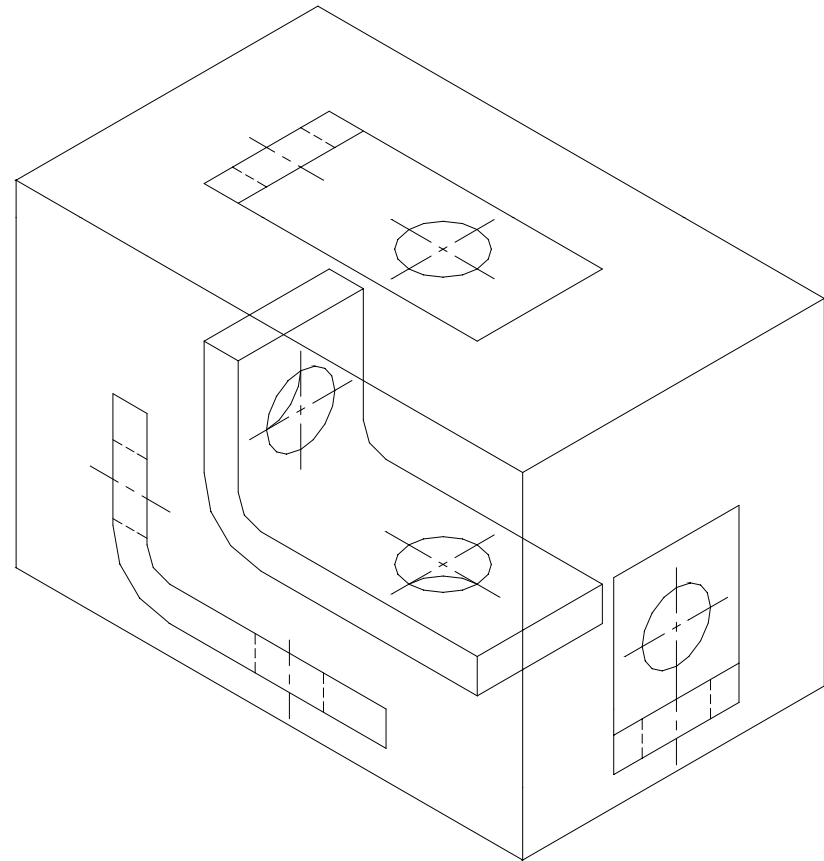


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## 2.1 ORTHOGRAPHIC DRAWINGS (PLANS, ELEVATION, & SECTION)

### Glass Box concept

- Envision the object surrounded in a glass box
- Project the views out onto the pieces of glass
- Each pane shows a 2D projection of the object



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## 2.1 ORTHOGRAPHIC DRAWINGS (PLANS, ELEVATION, & SECTION)

### Projection Planes

The three panes of glass represent the principal orthographic planes

Horizontal

Frontal

Profile

Each plane illustrates two of the principal dimensions:

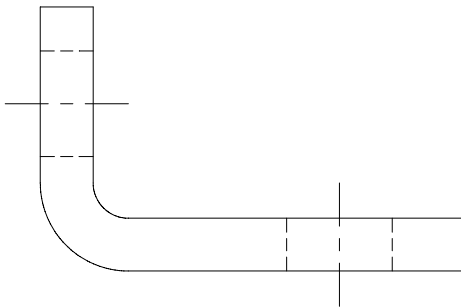
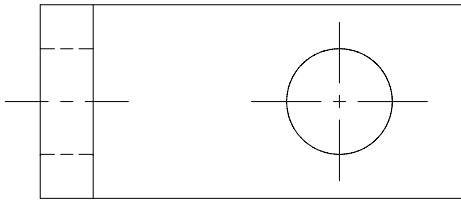
Height, Width, and Depth



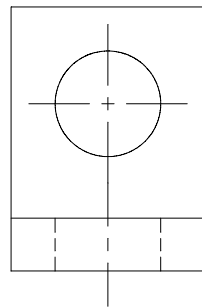
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## 2.2 ISOMETRIC DRAWINGS & DETAILS

**PLAN**

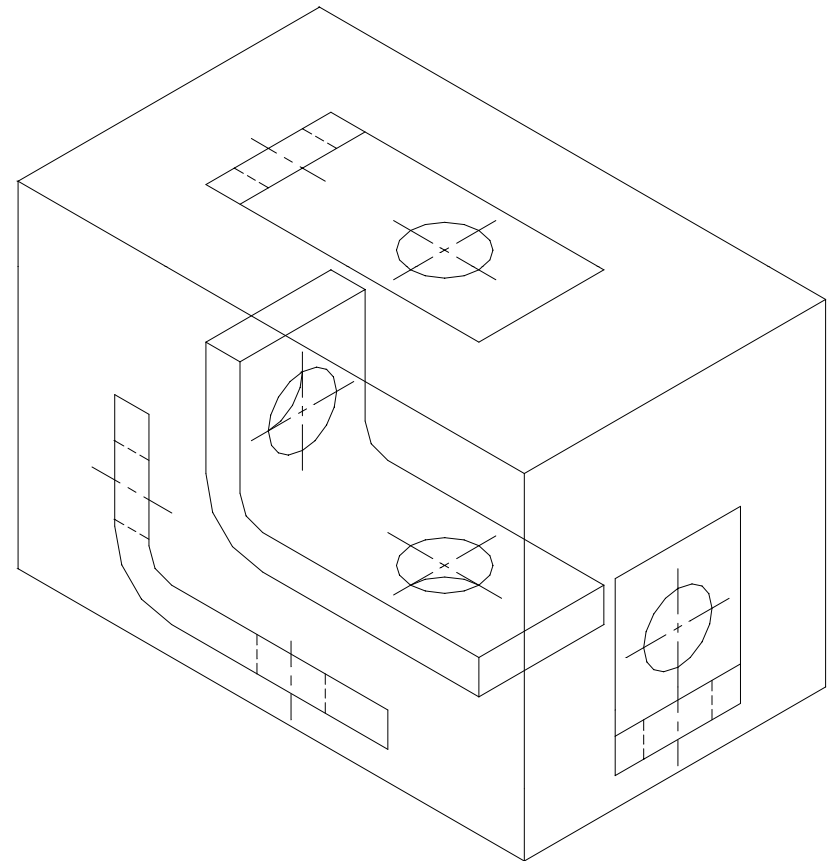


**ELEVATION**



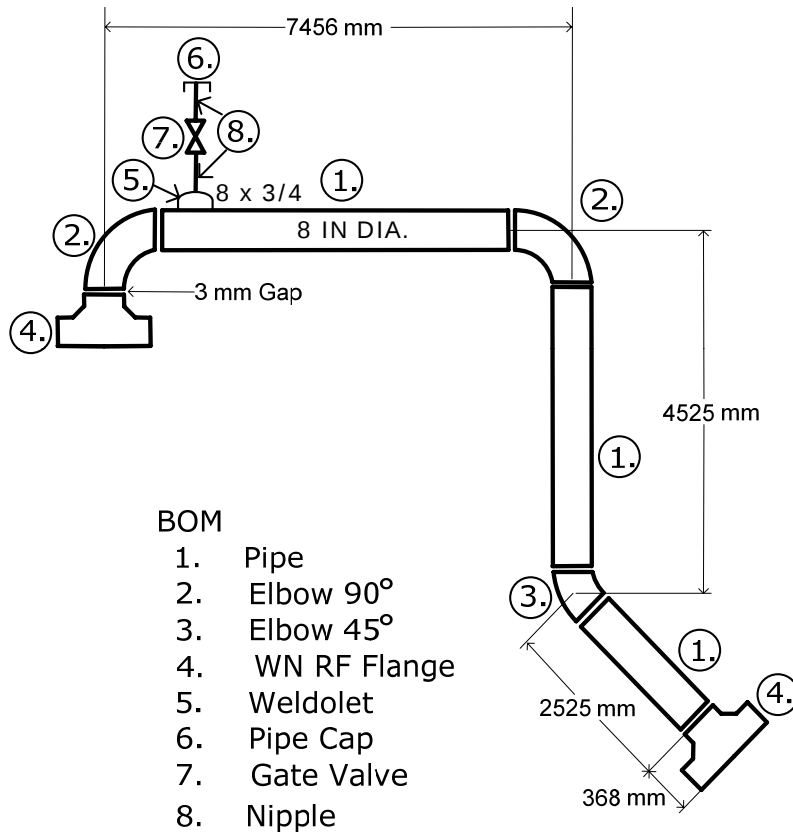
**RIGHT SIDE  
VIEW**

**ISOMETRIC VIEW**



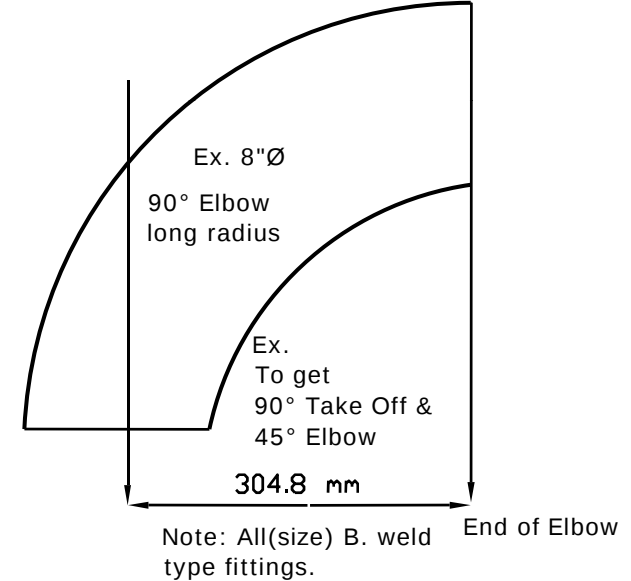
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## 2.2 ISOMETRIC DRAWINGS & DETAILS



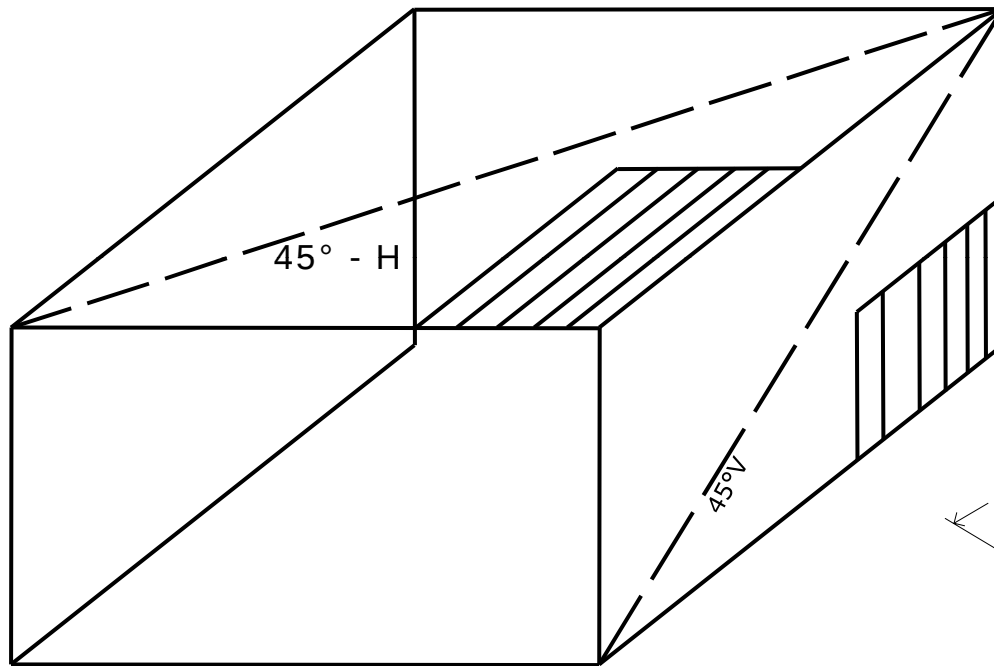
90° Elbow use take off 1.5 = English } **L.R.**  
 90° Elbow use take off 38.1 = Metric

45° Elbow use take off 0.625 = English System  
 45° Elbow use take off 15.875 = Metric System

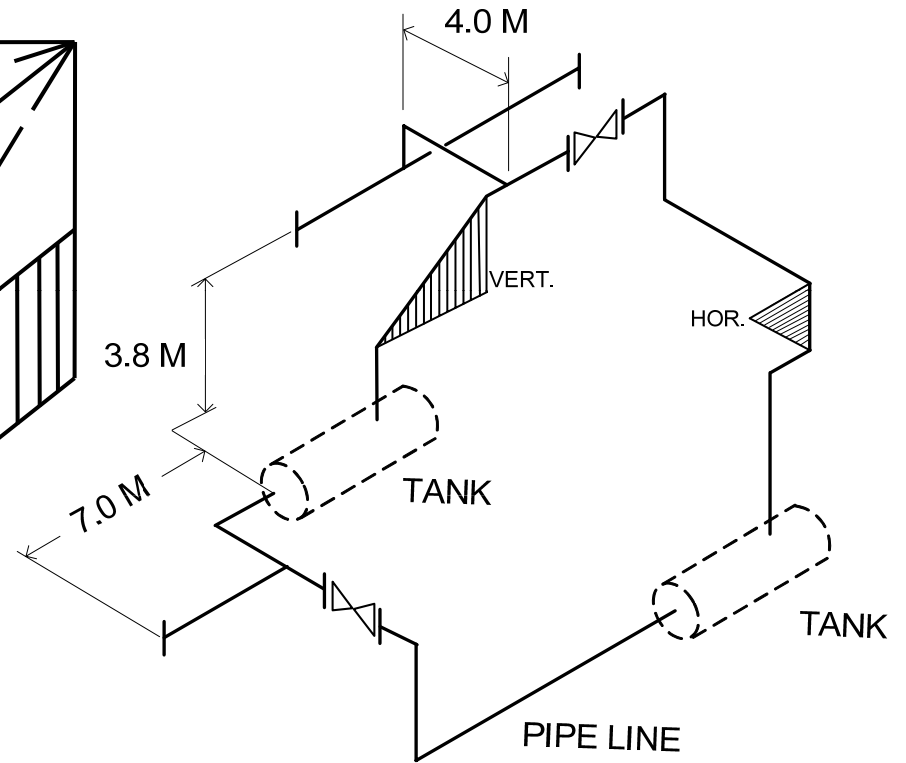


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## 2.2 ISOMETRIC DRAWINGS & DETAILS



**BOX**



**ISOMETRIC**



**EEI CORPORATION**

# PIPE FITTER TRAINING MODULE

## TOPICS

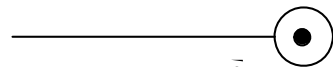
### 3. STANDARD TRADE SYMBOLS



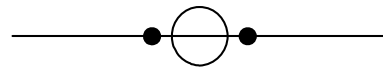
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### 3. STANDARD TRADE SYMBOLS

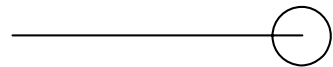
#### SYMBOLS OF PIPE ORTHOGRAPHIC & MEANING



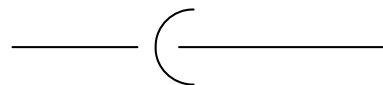
90 ° ELBOW UP



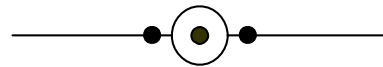
TEE DOWN



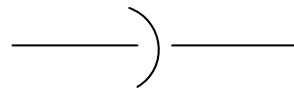
90 ° ELBOW DOWN



45 ° ELBOW UP



TEE UP



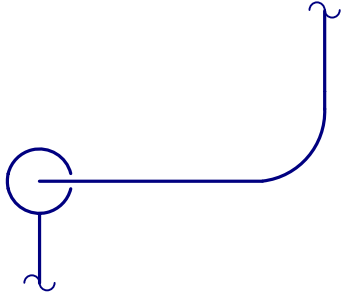
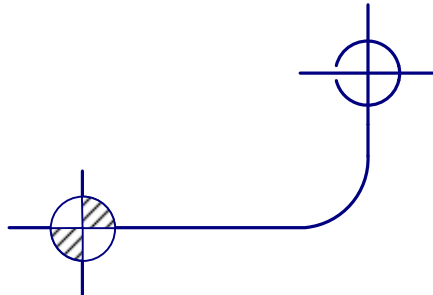
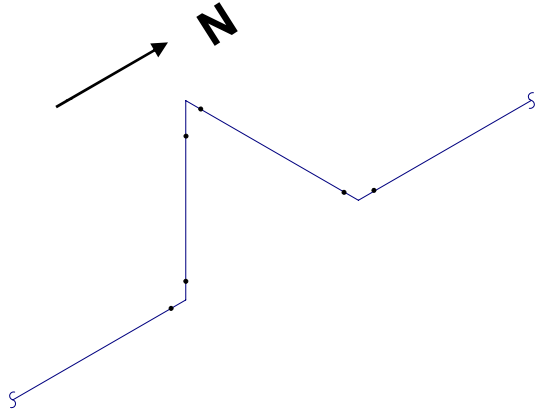
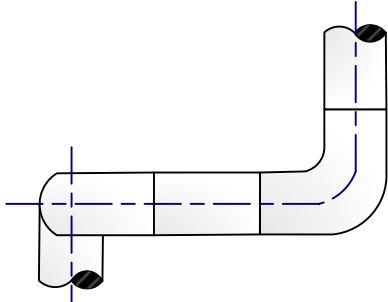
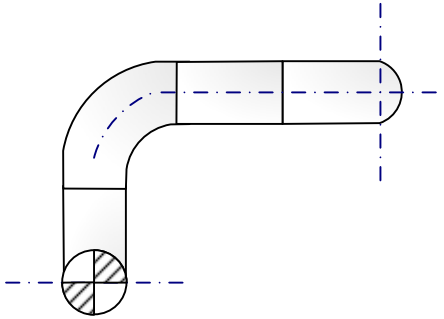
45 ° ELBOW DOWN



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### 3. STANDARD TRADE SYMBOLS

#### EXAMPLE FOR INDICATION OF PIPE FITTINGS (BUTT WELD TYPE)

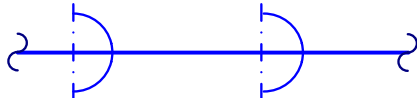
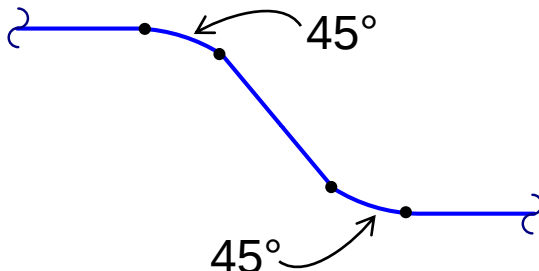
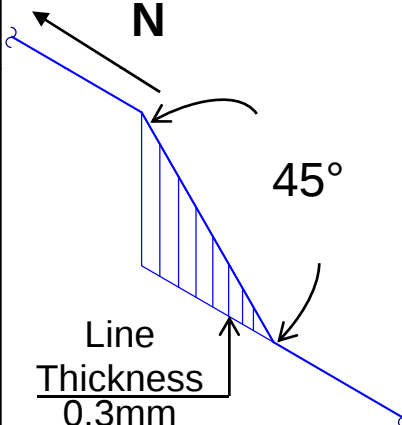
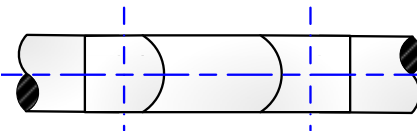
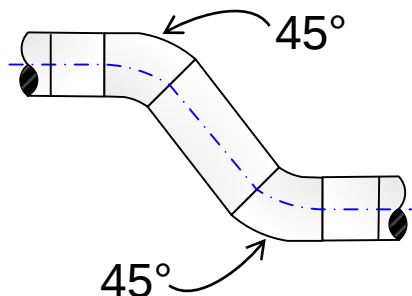
| ITEM      | PIPE SIZE              | PLAN                                                                               | SIDE VIEW                                                                           | ISOMETRIC                                                                            |
|-----------|------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 90° Elbow | 14 in. NPS and Smaller |   |   |  |
|           | 16 in. NPS and Larger  |  |  |                                                                                      |



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### 3. STANDARD TRADE SYMBOLS

#### EXAMPLE FOR INDICATION OF PIPE FITTINGS (BUTT WELD TYPE)

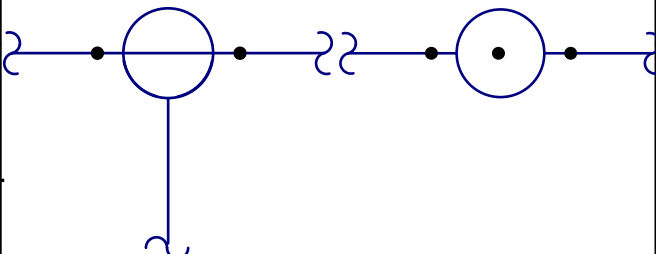
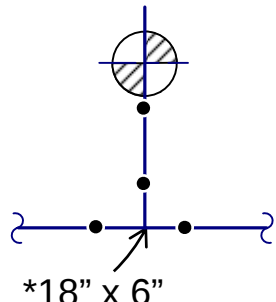
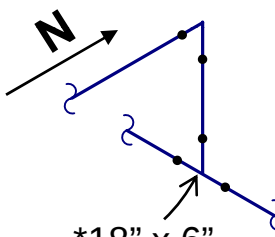
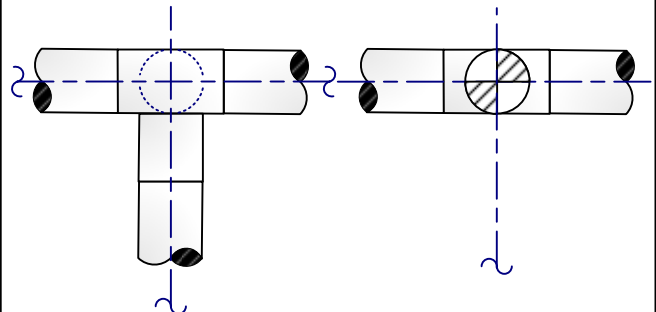
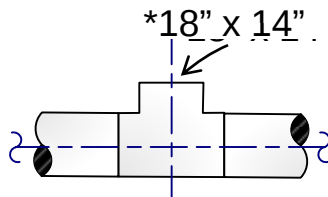
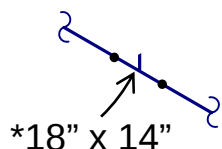
| ITEM      | PIPE SIZE              | PLAN                                                                                | SIDE VIEW                                                                           | ISOMETRIC                                                                            |
|-----------|------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 45° Elbow | 14 in. NPS and Smaller |    |   |  |
|           | 16 in. NPS and Larger  |  |  |                                                                                      |



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### 3. STANDARD TRADE SYMBOLS

#### EXAMPLE FOR INDICATION OF PIPE FITTINGS (BUTT WELD TYPE)

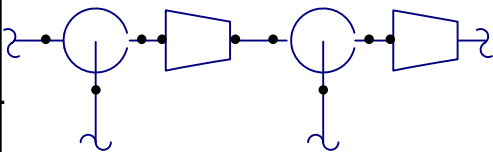
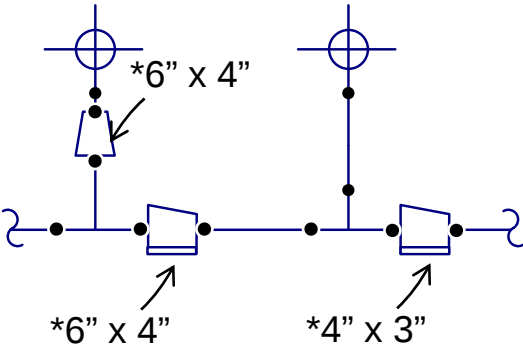
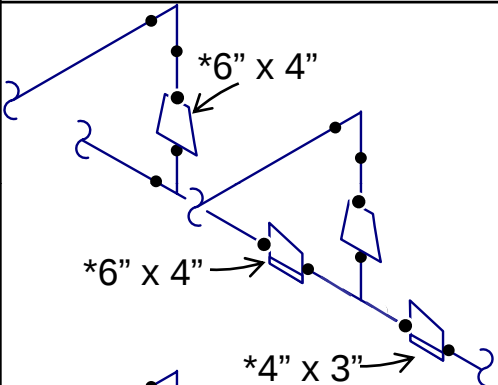
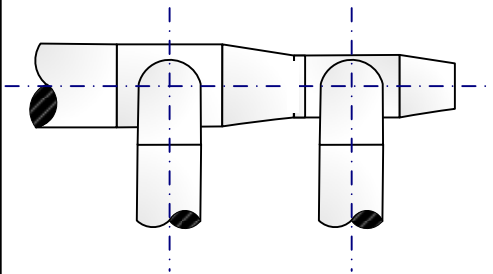
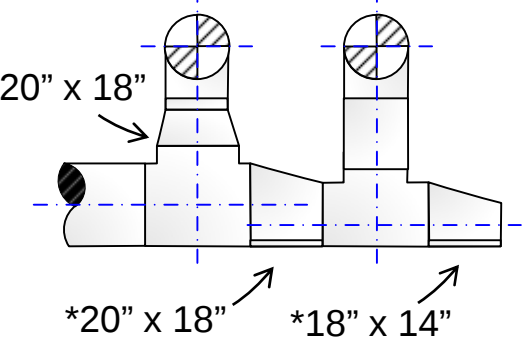
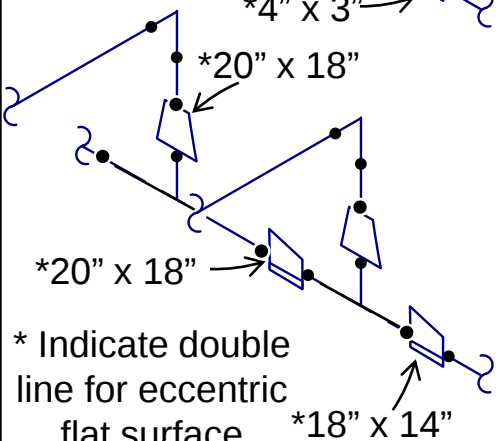
| ITEM | PIPE SIZE              | PLAN                                                                                | SIDE VIEW                                                                             | ISOMETRIC                                                                             |
|------|------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Tee  | 14 in. NPS and Smaller |   |    |    |
|      | 16 in. NPS and Larger  |  |  |  |



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### 3. STANDARD TRADE SYMBOLS

#### EXAMPLE FOR INDICATION OF PIPE FITTINGS (BUTT WELD TYPE)

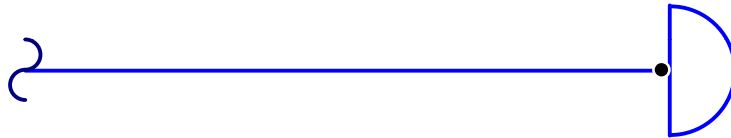
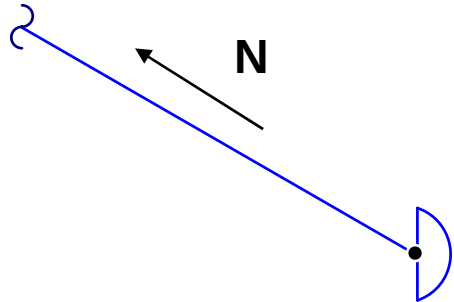
| ITEM                                                     | PIPE SIZE                       | PLAN                                                                                | SIDE VIEW                                                                           | ISOMETRIC                                                                            |
|----------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Con-<br>centric<br>and<br>Eccen-<br>tric<br>Redu-<br>cer | 14 in.<br>NPS<br>and<br>Smaller |    |   |   |
|                                                          | 16 in.<br>NPS<br>and<br>Larger  |  |  |  |



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### 3. STANDARD TRADE SYMBOLS

#### EXAMPLE FOR INDICATION OF PIPE FITTINGS (BUTT WELD TYPE)

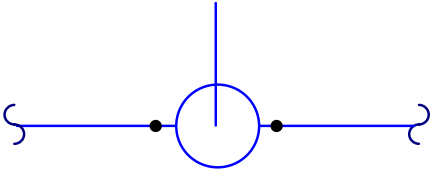
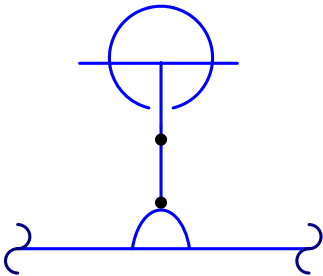
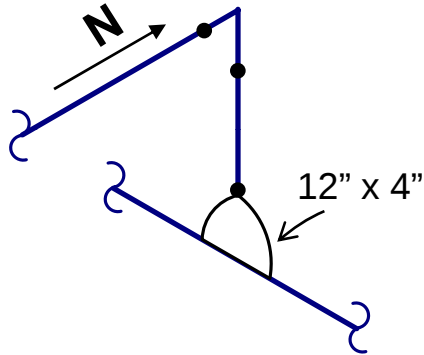
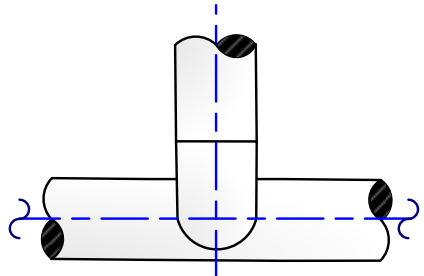
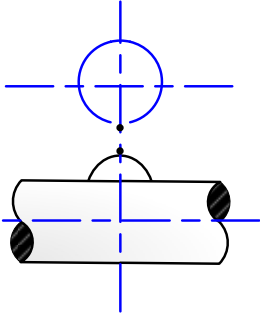
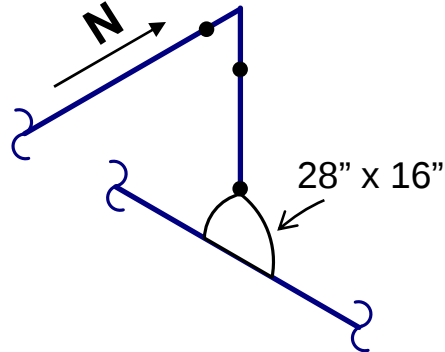
| ITEM | PIPE SIZE                       | PLAN                                                                                 | SIDE VIEW | ISOMETRIC                                                                            |
|------|---------------------------------|--------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------|
| Cap  | 14 in.<br>NPS<br>and<br>Smaller |    |           |  |
|      | 16 in.<br>NPS<br>and<br>Larger  |  |           |                                                                                      |



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### 3. STANDARD TRADE SYMBOLS

#### EXAMPLE FOR INDICATION OF PIPE FITTINGS (BUTT WELD TYPE)

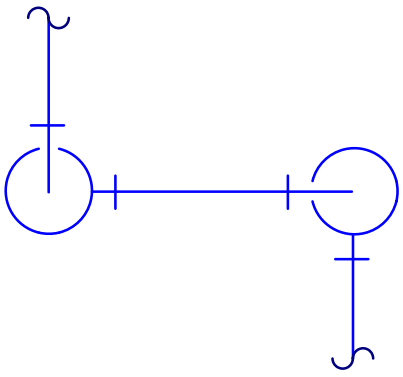
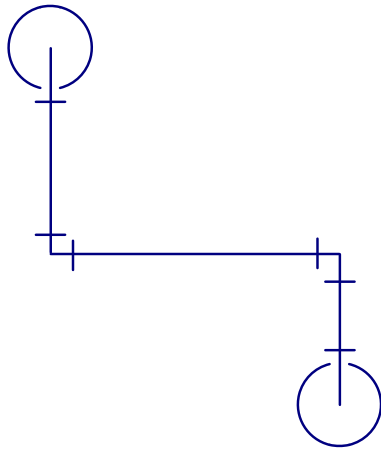
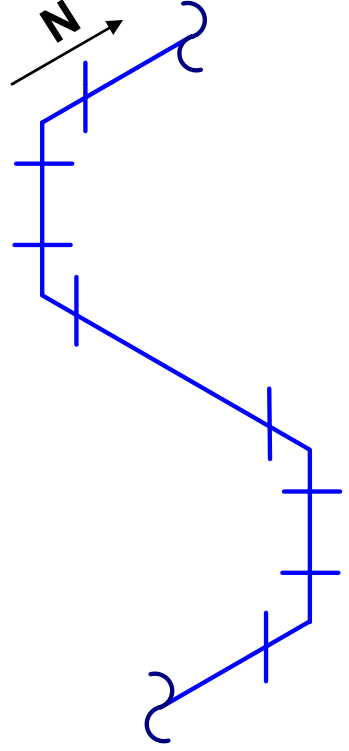
| ITEM  | PIPE SIZE              | PLAN                                                                               | SIDE VIEW                                                                            | ISOMETRIC                                                                            |
|-------|------------------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| O-let | 14 in. NPS and Smaller |   |   |   |
|       | 16 in. NPS and Larger  |  |  |  |



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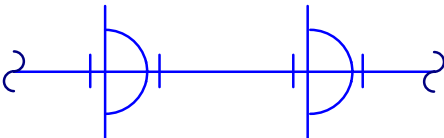
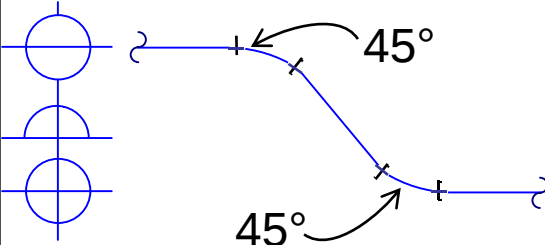
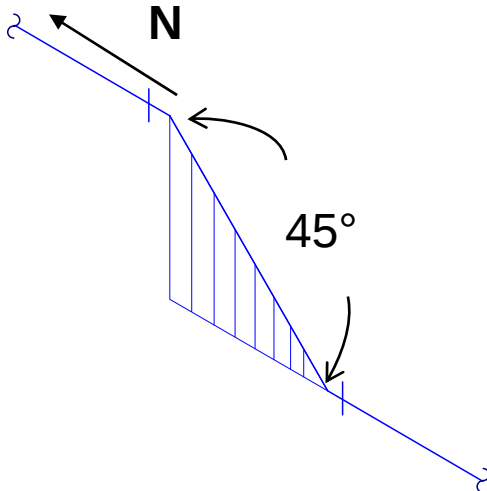
### 3. STANDARD TRADE SYMBOLS

#### EXAMPLE FOR INDICATION OF PIPE FITTINGS (THREADED TYPE )

| ITEM         | PLAN                                                                               | SIDE VIEW                                                                            | ISOMETRIC                                                                            |
|--------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 90°<br>Elbow |  |  |  |

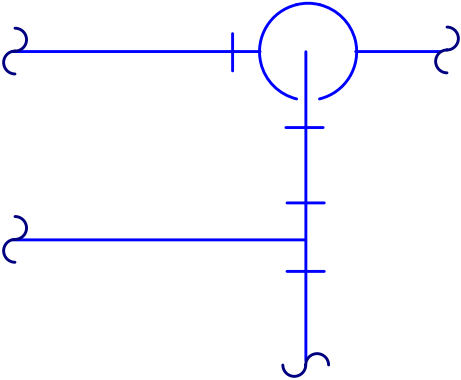
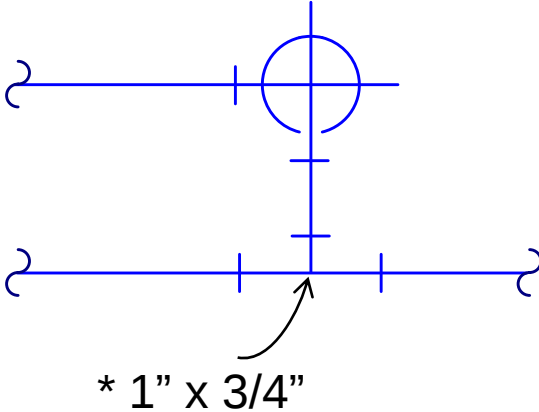
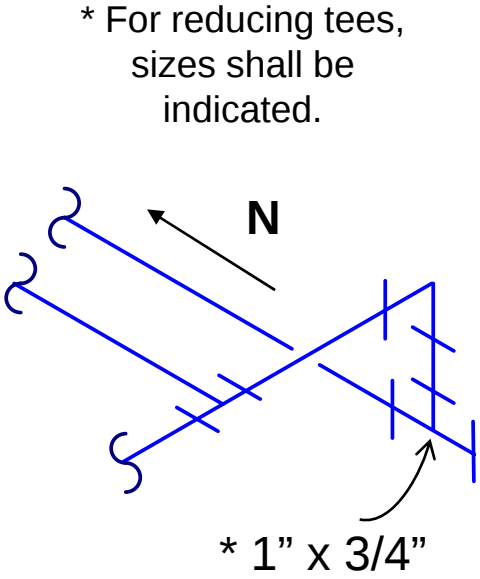
### 3. STANDARD TRADE SYMBOLS

#### EXAMPLE FOR INDICATION OF PIPE FITTINGS (THREADED TYPE )

| ITEM         | PLAN                                                                               | SIDE VIEW                                                                           | ISOMETRIC                                                                            |
|--------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 45°<br>Elbow |  |  |  |

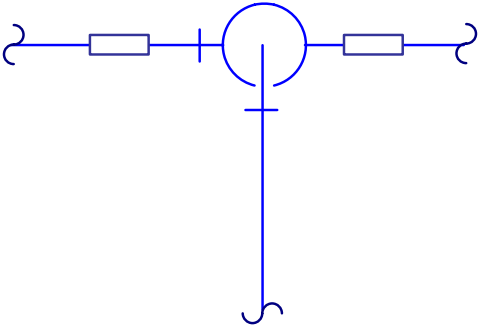
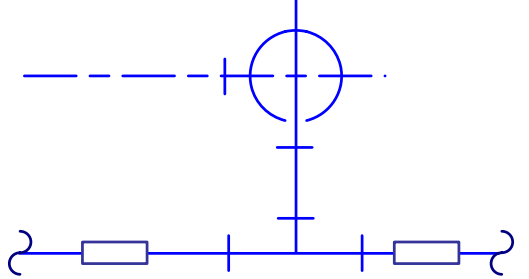
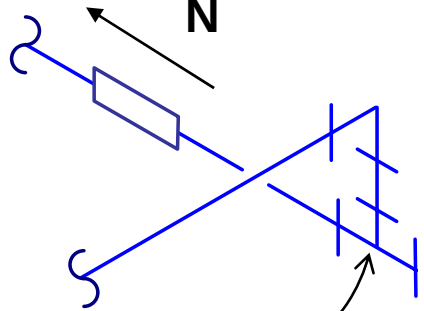
### 3. STANDARD TRADE SYMBOLS

#### EXAMPLE FOR INDICATION OF PIPE FITTINGS (THREADED TYPE )

| ITEM | PLAN                                                                               | SIDE VIEW                                                                           | ISOMETRIC                                                                            |
|------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Tee  |  |  |  |

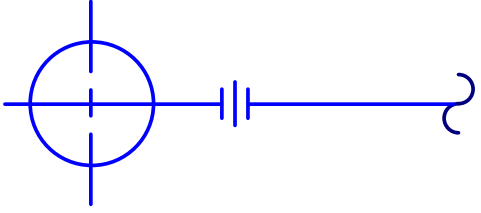
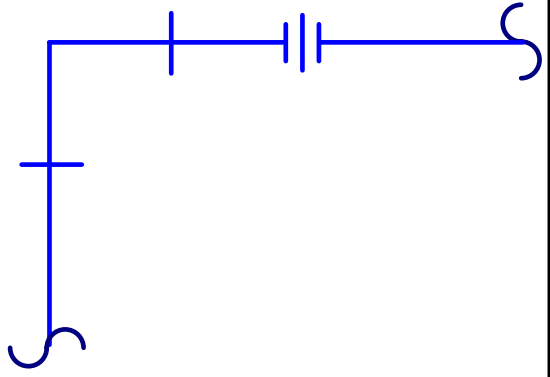
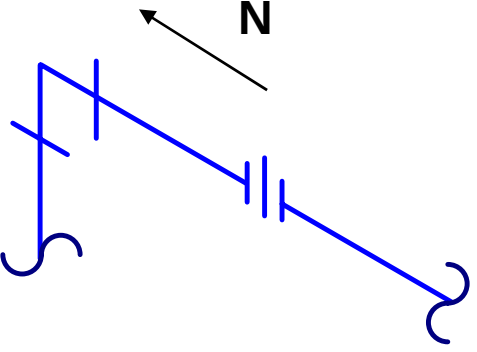
# 3 STANDARD TRADE SYMBOLS

## EXAMPLE FOR INDICATION OF PIPE FITTINGS (THREADED TYPE )

| ITEM     | PLAN                                                                               | SIDE VIEW                                                                           | ISOMETRIC                                                                                                                                                     |
|----------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Coupling |  |  | <p>* For reducing tees, sizes shall be indicated.</p>  <p>* 1" x 3/4"</p> |

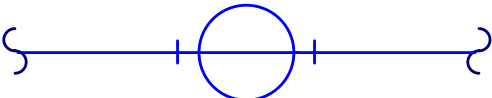
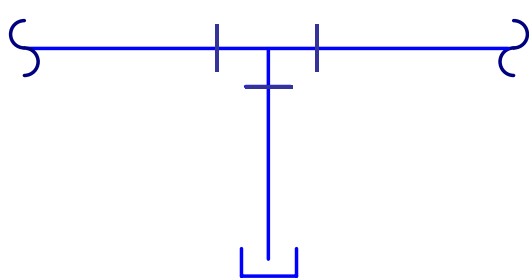
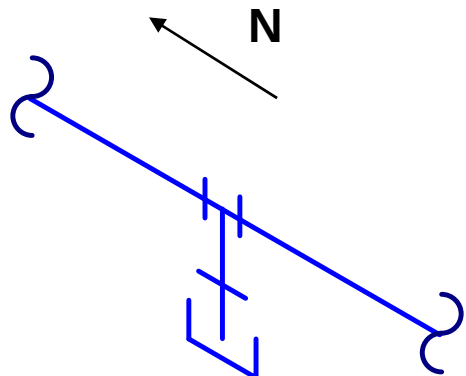
### 3. STANDARD TRADE SYMBOLS

#### EXAMPLE FOR INDICATION OF PIPE FITTINGS (THREADED TYPE )

| ITEM  | PLAN                                                                               | SIDE VIEW                                                                           | ISOMETRIC                                                                            |
|-------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Union |  |  |  |

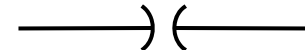
### 3. STANDARD TRADE SYMBOLS

#### EXAMPLE FOR INDICATION OF PIPE FITTINGS (THREADED TYPE )

| ITEM | PLAN                                                                              | SIDE VIEW                                                                           | ISOMETRIC                                                                            |
|------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Cap  |  |  |  |

### 3. STANDARD TRADE SYMBOLS

#### PIPE JOINT SYMBOL

|                                                                                      |   |               |
|--------------------------------------------------------------------------------------|---|---------------|
|    | - | WELDED JOINT  |
|    | - | SOLDERED      |
|    | - | BELL & SPIGOT |
|    | - | SCREWED       |
|   | - | FLANGE        |
|  | - | SOCKET WELD   |
|  | - | BUTT WELD     |



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### 3. STANDARD TRADE SYMBOLS

#### VALVES



- BALL VALVE



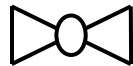
- GLOBE VALVE



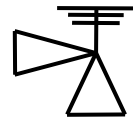
- CHECK VALVE



- GATE VALVE



- NEEDLE VALVE



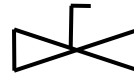
- SAFETY RELIEF VALVE



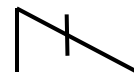
- CONTROL VALVE



- DIAPHRAGM VALVE



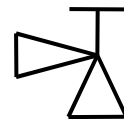
- PLUG VALVE



- BUTTERFLY VALVE



- 3 WAY VALVE



- ANGLE VALVE



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