

PALMER-BOWLUS FLUMES ARE A FORM OF THE TYPE IV FLUME, BEING DEPENDENT UPON AN EXISTING CONDUIT SLOPE AND CHANNEL CONTRACTIONS (PROVIDED BY THE FLUME) TO PRODUCE SUPERCRITICAL FLOW. THIS TYPE OF FLUME AROSE OUT OF A DESIRE TO HAVE A PRIMARY MEASURING DEVICE THAT COULD BE INSERTED INTO AN EXISTING CONDUIT, USUALLY ROUND, WITH MINIMAL SITE REQUIREMENTS OTHER THAN SUITABLE SLOPE.

Flume Size	Maximum US Slope (%)	Min Flow (gpm)	Max Flow (gpm)
6 inch	2.2	7.0	131
8 inch	2.0	14	310
10 inch	1.8	23	502
12 inch	1.6	31	752
15 inch	1.5	49	1385
18 inch	1.4	70	2071
21 inch	1.4	100	3161
24 inch	1.3	132	4248
27 inch	1.3	169	5870
30 inch	1.3	216	7410

1. THE STANDARD FLUME TYPE (PALMER BOWLUS FLUME) MUST BE SELECTED UNLESS THE SITE DOES NOT MEET THE CRITERIA BELOW. IF THE SITE DOES NOT MEET THE CRITERIA BELOW THEN THE SECONDARY FLUME (TRAPEZOIDAL) SHALL BE SELECTED FOR THE SITE.
2. THE MINIMUM FLOW FOR THE SITE (TYPICALLY IN NIGHT) AND THE MAXIMUM FLOW FOR A SITE (TYPICALLY DURING WET WEATHER EVENTS) MUST BE WITHIN THE ACCURATE FLOW RANGES DEPICTED IN TABLE 1.
3. IF THE FLOW RANGES ARE SUITABLE FOR THE MINIMUM AND MAXIMUM FLOWS OBSERVED AT THE SITE, THE FLUME SIZE SELECTED SHALL MATCH THE UPSTREAM NOMINAL PIPE SIZE.
4. THE FLUME SIZE REQUIRED TO MEET THE FLOW RANGES MUST BE WITHIN (2) NOMINAL PIPE SIZES OF THE SITE'S UPSTREAM PIPE. IF THE NOMINAL UPSTREAM PIPE SIZE AND THE FLUME SIZE ARE NOT THE SAME, A GRADUAL SMOOTH TRANSITIONAL TAPERED APPROACH FROM PIPE TO FLUME SHALL BE FORMED DURING INSTALLATION AT A 3:1 CONVERGENCE OR DIVERGENCE.
5. THE UPSTREAM PIPE'S SLOPE MUST BE LESS THAN THE MAXIMUM SLOPES IN TABLE 1 FOR THE CORRESPONDING FLUME SIZE.

STANDARD FLUME – PALMER BOWLUS FLUMES

IN AN ATTEMPT TO OBTAIN WIDER RANGES OF DISCHARGE THAN THOSE AVAILABLE WITH PALMER BOWLUS FLUMES, SEVERAL INVESTIGATORS HAVE CONSIDERED SUPERCRITICAL TRAPEZOIDAL FLUMES. TRAPEZOIDAL FLUMES GENERALLY OPERATE AS TYPE IV FLUMES. THE OUTWARD SLOPING OF THE FLUME WALLS PROVIDES INCREASED SENSITIVITY TO LOW DISCHARGE RATES FOR A GIVEN SIZE AND, HENCE, INCREASED RANGE.

Flume Size	Approach Width	Minimum Flow	Maximum Flow
Small 60 degree Trapezoidal	6	1.4	24
Large 60 degree Trapezoidal	10	5.2	116
X-Large 60 degree Trapezoidal	18	0.4	695
2-inch WSC 60 degrees	18	8.1	1126
2-inch WSC 45 degrees	24	12	1128
2-inch WSC 30 degrees	36	14	1737

1. THE MINIMUM FLOW FOR THE SITE (TYPICALLY IN NIGHT) AND THE MAXIMUM FLOW FOR A SITE (TYPICALLY DURING WET WEATHER EVENTS) MUST BE WITHIN THE ACCURATE FLOW RANGES DEPICTED IN TABLE 2.
2. IF THE FLOW RANGES FOR THE SITE DO NOT FIT WITHIN THE RANGES DEPICTED IN TABLE 1 OR TABLE 2, ALTERNATIVE FLUME TYPES OR FLOW MONITORING METHODS MUST BE DISCUSSED AND APPROVED BY THE CITY OF JOLIET.
3. IF THE FLOW RANGES ARE SUITABLE FOR THE SITE, THE FLUME SIZE SELECTED SHOULD BE THE FLUME WITH APPROACH WIDTH CLOSEST TO THE UPSTREAM NOMINAL PIPE SIZE. A GRADUAL SMOOTH TRANSITIONAL TAPERED APPROACH SHALL BE FORMED DURING INSTALLATION BETWEEN THE UPSTREAM PIPE AND THE FLUME AT A 3:1 CONVERGENCE OR DIVERGENCE.

SECONDARY FLUME – TRAPEZOIDAL FLUMES

NOTES:

1. SEE TELEDYNE ISCO OPEN CHANNEL FLOW MEASUREMENT, 7TH EDITION FOR MORE DETAIL.
2. UNLESS APPROVED BY THE CITY, THE FOLLOWING FLUMES WILL NOT BE ACCEPTED AS FLOW MEASURING DEVICES:
 - MONTANA FLUMES
 - PARSHALL FLUMES
 - LEOPOLD-LAGCO FLUMES
 - H, HS AND HL FLUMES
 - BRITISH RECTANGULAR FLUMES
 - VENTURI FLUMES
 - KHAFAGI FLUMES
 - SAN DIMAS FLUMES

NOT TO SCALE

CITY OF JOLIET, ILLINOIS
SEWER FLOW MONITORING
(GRAVITY)
SELECTION AND
SIZING OF FLUME
SAN-07

DATE: OCT. 2017