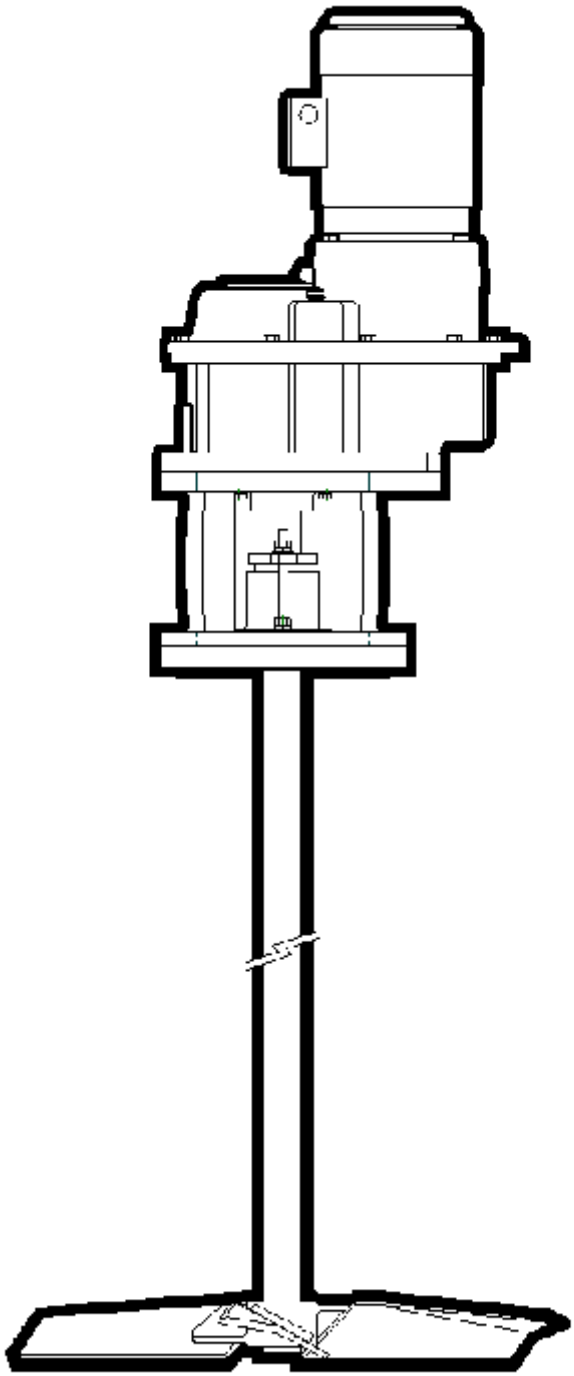
Chemineer

Supplement 416.2

GTA/GTL/GTNT Turbine Agitators
Angle Mount Supplement



Reference IOM Manual 416

Chemineer, Inc.
A Unit of Robbins & Myers, Inc.

OPTIONAL ANGLE MOUNTED DRIVE

Case 1 and 2 GT agitator drives are available with 10E angle mounting option.

Angle mounting required a specific mounting orientation and a special dip stick **[258]** to indicate the correct oil level. The angle of the gear drive **must** be oriented such that the motor end of the gear drive is low. See *Figures 2 and 3, pages 4 and 5*.

The special dip stick is identified by the marking, *ANGLE MOUNT-10 DEG.* on the wand. The approximate oil capacity for case size 1 or 2 GT gear drive mounted at 10E is 1.08 Gallon (4.1L). Always fill to the full mark on the dip stick.

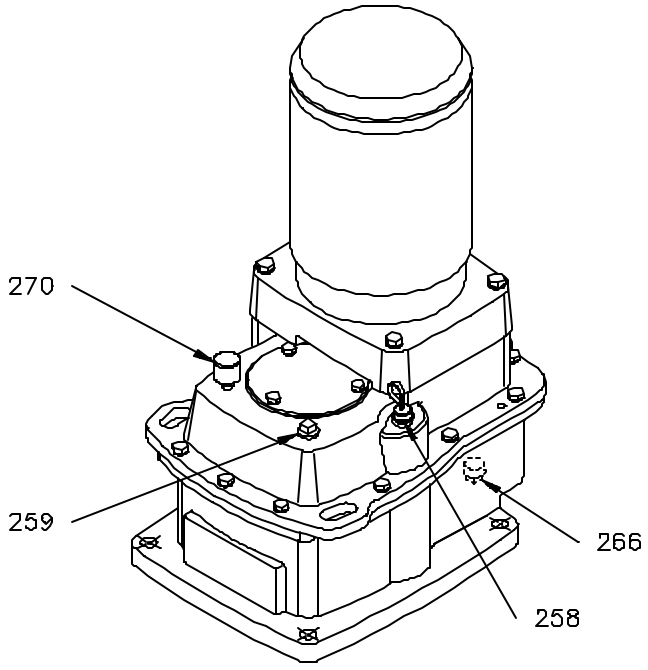


Figure 1: Gear Drive Oil Level Dip Stick

MOUNTING

GTA, GTL and GTNC style units are designed to mount on an ANSI flange, nozzle or pad located on the vessel top head. See *Figure 3, page 5*.

Case size 1 and 2 GT drives are available with a 10E angle mounting option. Angle mounting requires a specific mounting orientation. The angle must be 10E and the gear drive must be orientated such that the motor end of the gear drive is low. See *Figures 2 and 3, pages 4 and 5*.

During operation of the agitator, the fluid motion in the vessel produced by the rotation of the turbine impeller can exert significant forces and moments on the agitator extension shaft. The forces and moments produced by the turbine rotating in a fluid are; torque, turbine thrust and turbine hydraulic (side) force. Torque implies an unchanging load, but the actual operating torque will show plus or minus 10 to 20 percent variability due to the turbulent conditions within the agitated fluid. Start up of the agitator with the turbine impacted in solids is beyond the scope of these recommendations. Hydraulic forces acting on the turbine generate moments, which act on the shaft and are transmitted to the agitator drive. Because of the random nature of the forces and the rotation of the shaft, the direction of these forces is constantly changing. A pitched blade or axil flow turbine normally pumps downward and generates an upward thrust. The thrust force is generally less than the weight of the unit. Upward pumping turbine thrust force will add to the unit weight. The net effect of the turbine thrust force is to offset or add to the unit weight, contribuiting to the variability of the support structure loading. The agitator has been designed to accommodate these forces, and as a result, the forces are transmitted directly to the agitator mounting nozzle or pad. The nozzle or pad and vessel top head must be rigid enough to support the agitator weight and limit the angular displacement of the agitator drive to .05 degrees as a result of the torque and bending moment. Refer to the agitator assembly drawing for the nozzle or pad design loads.

See *Tables 2 and 3, page 7*, for the recommended vessel head thickness vs. vessel diameter, agitator case size and mounting nozzle or pad size. These tables are to be used as a guide for determining when vessel head reinforcement is required.

The tables are based upon the use of ASME flanged and dished heads, atmospheric design pressures and ChemScale® agitation levels of 6 to 7. Elliptical or hemispherical heads of the same diameter and thickness are more rigid than ASME flanged and dished heads. Design pressures greater than atmoshpheric may require vessel head thicknesses greater than the table values.

MOUNTING

Very high ChemScale agitation levels may require vessel thicknesses greater than the table values. If the vessel head is not rigid enough, the head thickness can be increased or a reinforcement pad (*Figure 4, page 6)* can be added.

This information is intended as a guide and does not relieve the usder of completely analyzing the entire mounting system.

ANGLE MOUNTED DRIVE, MODELS GTA, GTL & GTNT

Case size 1 and 2 GTA, GTL AND GTNT agitator drives, furnished with the 10E angle mounting option, may be angle mounted. See *Figure 3, page 5,* for agitator nozzle locaation. See *pages 6, 7 and 8* for structural requirements.

NOTE: Angle mounted units must have the extension shaft assembled in a vertical position, prior to installtion on the vessel. The standard assembly and disassembly instructions in *Manual #416, Figure 18, page 31).*

Install the assembled agitator drive onto the vessel nozzle using gasket and fastener set **[1119]** furnished by customer (on stud mounted units, studs **[1258]** supplied). Torque bolts to the value shown in *Manual #416, Table 6, page 19.*

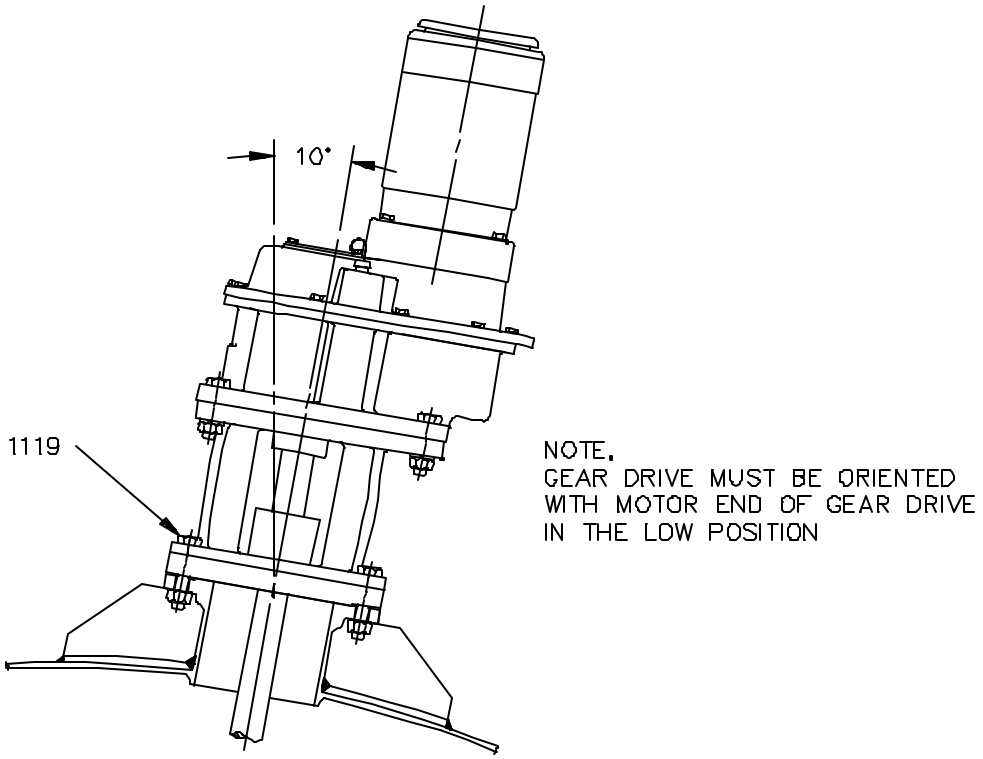


Figure 2: Angle Mounting

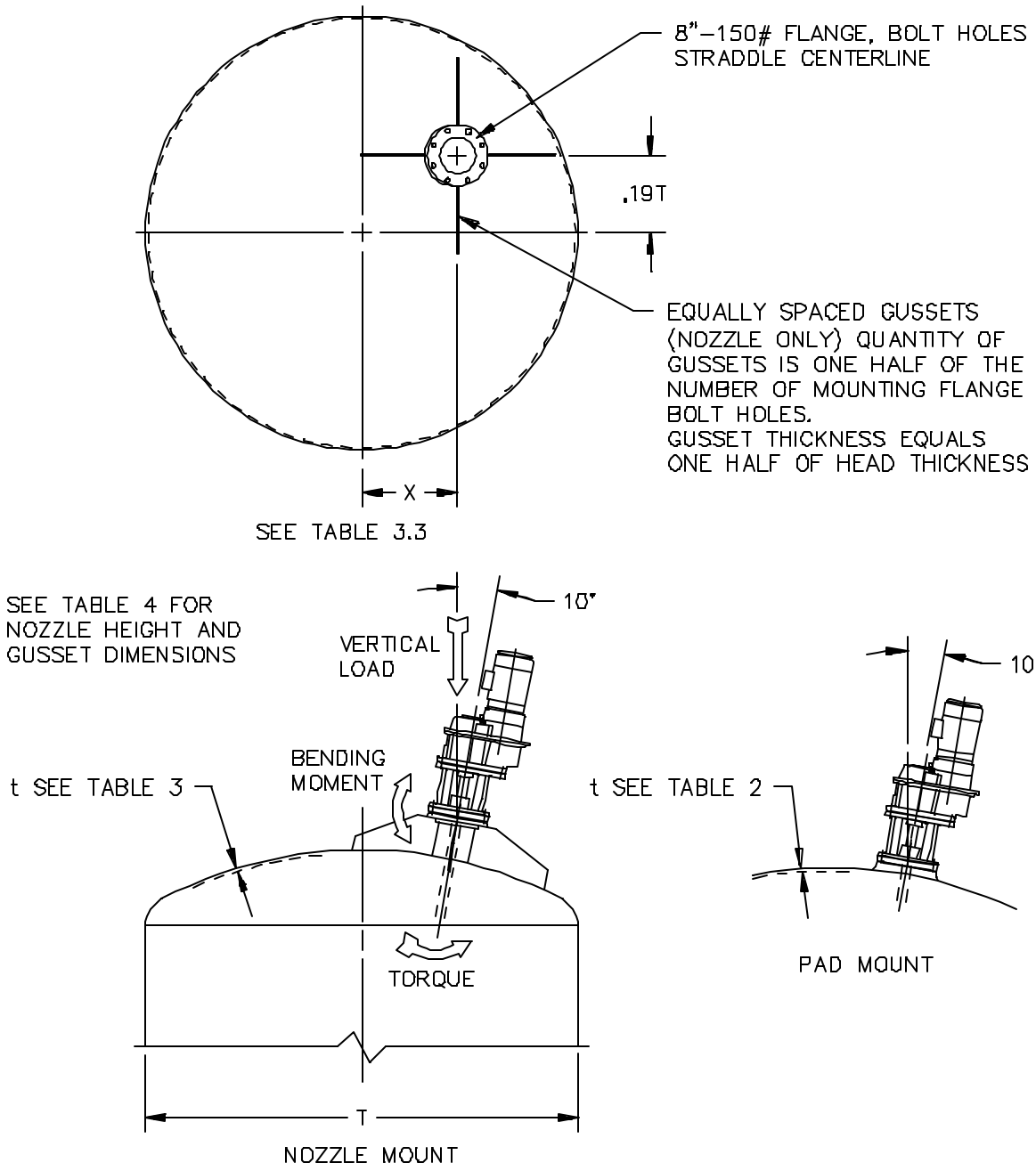


Figure 3: Angle Mounting

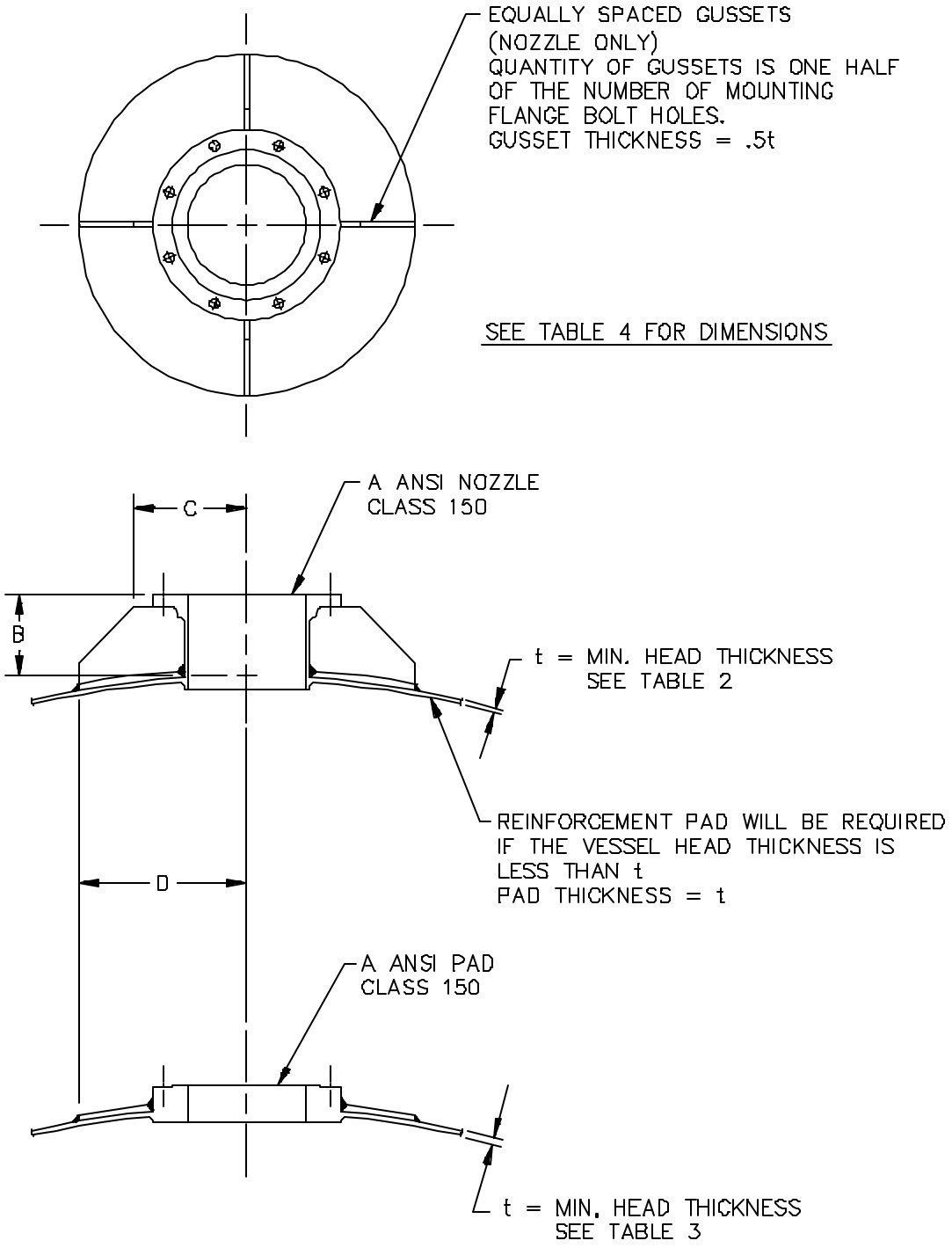


Figure 4: Vessel Mounting Nozzle/Pad

TABLE 2: VESSEL HEAD THICKNESS (t), NOZZLE MOUNT

VESSEL DIAMETER (Ft/m)	CASE SIZE (NOZZLE SIZE)	
	1GT (8")	2GT (8")
4 (1.22)	.125" (3.18mm)	.188" (4.78mm)
5 (1.52)	.188" (4.78mm)	.188" (4.78mm)
6 (1.83)	.188" (4.78mm)	.250" (6.35mm)
7 (2.13)	.250" (6.35mm)	.313" (7.95mm)
8 (2.44)	.250" (6.35mm)	.313" (7.95mm)
9 (2.74)	.313" (7.95mm)	.375" (9.53mm)
10 (3.05)	.313" (7.95mm)	.375" (9.53mm)
12 (3.66)	.375" (9.53mm)	.438" (11.12mm)
15 (4.57)	.500" (12.70mm)	.563" (14.30mm)
20 (6.10)	.625" (15.88mm)	.688" (17.48mm)

TABLE 3: VESSEL HEAD THICKNESS (t), PAD MOUNT

VESSEL DIAMETER (Ft/m)	CASE SIZE (NOZZLE SIZE)	
	1GT (8")	2GT (8")
4 (1.22)	.125" (3.18mm)	.125" (3.18mm)
5 (1.52)	.125" (3.18mm)	.125" (3.18mm)
6 (1.83)	.125" (3.18mm)	.125" (3.18mm)
7 (2.13)	.125" (3.18mm)	.125" (3.18mm)
8 (2.44)	.125" (3.18mm)	.188" (4.78mm)
9 (2.74)	.125" (3.18mm)	.188" (4.78mm)
10 (3.05)	.188" (4.78mm)	.188" (4.78mm)
12 (3.66)	.188" (4.78mm)	.188" (4.78mm)
15 (4.57)	.188" (4.78mm)	.250" (6.35mm)
20 (6.10)	.250" (6.35mm)	.250" (6.35mm)

TABLE 3.3: OFF CENTER MOUNTING

Shaft Extension Range In. (mm)	CASE SIZE 1 AND 2	
	"X" Dimension In. (mm)	Minimum Tank Diameter In. (mm)
38" - 53" (965-1346)	7.5" (191)	22" (559)
54" - 76" (1372-1930)	10.75" (273)	32" (813)
77" - 110 (1956-2794)	15.5" (394)	46" (1168)
111" - 158" (2819-4013)	22.5" (572)	66" (1676)
159" - 227" (4039 - 5766)	32" (813)	96" (2438)

TABLE 4: AGITATOR MOUNTING NOZZLE/PAD REINFORCEMENT DIMENSIONS

CASE SIZE	A	B	C	D
1GT	8"	6" (152mm)	8" (203mm)	10.5" (267mm)
2GT	8"	6" (152mm)	8" (203mm)	12" (305mm)