## APPENDIX C. SAMPLE CLAMP FORCE AND TORQUE FORCE CALCULATION FOR AN AIRCRAFT (F593C bolt)

Refer to **Figure B-1.**

### B.1 Given Information:

- Airport management must determine the governing aircraft for their airport in determining the clamping force and bolt torque needed for securing the in-pavement light fixtures.
- For this sample calculation, an aircraft tire load of 59,400 pounds **[A1]** per tire at 218 psi **[A2]** tire pressure is assumed. This tire loading is similar to a Airbus 380-800 aircraft.
- The in-pavement light fixture has a 12″ diameter and a surface area of 113 si. **[C]**
- The coefficient of traction (friction) between the tire and the pavement light fixture is assumed to be 0.8. **[D]**
- The coefficient of friction between the light fixture flange and the light base (or the light base extension ring) is assumed to be 0.42. The coefficient of friction value can vary based on coatings of the faying surfaces light base and light fixture. **[E]**
- The same conservative coefficient of friction of 0.42 is assumed for the bolt clamping force and torque calculations. Six (6) bolts are used to secure the light fixture to the base. **[G]**

### B.2 Sample Calculation:

**A1:** Tire Load = 59,400 pounds

**A2:** Tire Pressure = 218 psi

**B:** Tire Contact Area = A1 / A2 = 272.47 si rounded to 272.5 si.

**C:** Maximum Normal Force on the in-pavement light fixture = A1 ×(113/B) = 24,631 pounds rounded up to 24,700 pounds.

**D:** Traction Force imparted to the light fixture = C ×0.8 = 19,760 pounds

**E:** Resisting Frictional Force between the light fixture and light base = C ×0.42 = 10,374 pounds

**F:** Differential Force the in-pavement light fixture bolts must handle = D –E = 9,385 pounds

**G:** Clamp Force = (F/6)/0.42 = 3,724 pounds

The grade of bolt to be used must be based on 75% of the proof strength.

**Note:** The 3/8″ ASTM F593C bolt has a rated clamping force of 3778 pounds and is adequate for this installation.