March 26, 2021

Mr. John Prince
Delane Engineering- Owner
San Diego Mission Valley High Rise Hotel
4909 Murphy Canyon Rd. #330
San Diego, CA 92123


Dear John,

This technical document serves as the Water System Analyses for the San Diego Mission Valley High Rise Hotel onsite water systems Project. The purpose of this study is to verify potable and fire water demand for the Project and to analyze onsite systems for adequate pressure and flow to every fixture at all times. This will ensure that Health, Safety and Noise considerations will be taken into account.

Project Background

The project is in the mission valley area at 9449 Friars Rd, San Diego CA, 92108. It is the former location of Qualcomm/ Aztec Stadium and is currently serving as an additional parking lot for the SDSU West Project. The 3.8 acre area will eventually become a 9 story hotel that includes a conference room and a parking structure.

SDSU West will serve higher education, the public good, and the community’s goals and aspirations including NCAA Division 1 sports. This new construction has prompted the need for a thorough study of the projected onsite water systems.

See Figure 1 for Project Location

Figure 1-Project Location (32.7859, -117.1217)
### Existing Water Service

The Project is located within the SDSU West master plan. Potable service for the area is provided by the Lake Murray Treatment Plant, located along Lake Murray Road to the North East of the Project location. The anticipated hydraulic grade line of the Project is 81 feet, as provided by the grading plans and boring logs provided to Centaur Solutions.

The campus will have separate potable and fire systems.

**Figure 2 Existing Water Service (POC TBD)**

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### Potable Water Service

The onsite potable water system use includes drinking, cooking, toilet flushing, (pool filling), and bathroom services. Existing public service lines along Friars Rd. and Road (b) currently provide service to the entire SDSU West site along with backflow prevention. A separate 2" meter with backflow protection will be installed along Road (a), to supply the hotel, conference room, and parking structure demand.

See **Figure 2** for existing potable layouts surrounding the Project.

### Design Criteria

Design criteria for the potable water systems are per the City’s Design Guidelines, as presented in **Table 1**.

### Table 1- Design Criteria

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Potable Water Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Flow</td>
<td>Min 1500 gpm (need to size)</td>
</tr>
</tbody>
</table>
Minimum Static Pressure | 65 psi
---|---
Minimum Pressure, MDD + Fire | 20 psi
Minimum Pressure, Peak Hour | 40 psi
Maximum Pressure Drop | 25 psi
Maximum Velocity, MDD + Fire | 15 fps
Maximum Velocity, Peak Hour | 8 fps

**Water Demand**

*Potable Water Demand*

The use of fixture units to project peak water demand can be performed on a building to building basis. This methodology, described in the California Plumbing Code (CPC), utilizes the total number of plumbing fixtures (hot and cold) to determine the peak flow to a building. The relationship between fixture units and peak flow per the CPC is provided in (Appendix A). This method is used to size the meter and laterals into a single building. Proper procedure for this methodology is to sum the total amount of fixtures for the building to determine the total peak flow. (See Appendix A).

Based on the calculations and appendix the hotel will require a 2” meter and a 2.5” supply line to supply a peak demand of 468 gpm. Since the hotel is being sized by CPC fixture methodology it is not warranted to calculate future demand unless the building is enlarged.

*Fire Water Demand*

The hotel will require its own separate fire flow based on building square footage and construction type per the California Fire Code (CFC) requirements. (See Appendix B.) The system will be connected with backflow preventers from connections to the existing City of San Diego public system. Done by April 6th, 2021

**Initial Assumptions**

1) The 1st level floor is at 0 feet in height and approx 81 feet in elevation (from boring log initial bore height).
2) The 1st level ceiling is 20 feet in height above the 1st level floor and approx 101 feet in elevation.
3) The 2nd level floor and 1st level ceiling are equal in height and elevation.
4) Each subsequent level is 10 feet of height above the prior which reaches the roof at 9th level ceiling.
5) An additional 3 feet is assumed to be the last fixture height on the roof and will be used as the governing fixture (hose bib).
6) Levels 2-9 are to be 13,000 square feet and will contain 330 square foot rooms (Standard size off google) and therefore contain 40 rooms per level. For a total of 320 rooms.
7) Each room shall contain one wash closet, one lavatory, and one bath/shower combination.
8) Each level (1-9) shall contain one Mop Basin or Service Sink
9) Level 1 shall contain a 2000 square foot lobby area with 8 wash closets, 6 lavatories, and 4 urinals
10) Level 1 shall contain a fitness area and Locker containing 6 shower heads and 4 lavatories
11) A Mechanical Equipment Room (MER) shall be installed on the 4th level to have approximately 200gpm pumped (See Appendix B for recommended product) to levels 5 through 9.
12) The total fixture height shall be 103 feet in height and 184 feet in elevation for the governing fixture

Recommendations

1) Centaur Solutions recommends purchasing an Omni C² 2” meter, a Watts Series 009 reduced pressure assembly backflow prevention device, 2 Watts LF223 High Capacity Water Pressure regulator valves and a Bell and Gossett Series e-80 In-Line Centrifugal Pump pump (See Appendix C for specification sheets).
2) A 2 ½” main pipe will serve a peak demand of 468 gpm based on CPC fixture sizing (See Appendix A)
3) Fire Demand Recommendations by April 6th, 2021 (See Appendix B)
4) Fire Demand Recommendations by April 6th, 2021 (See Appendix B)

If there is any questions or comments, please feel free to contact Centaur Solutions at 619-706-8484

Sincerely,

Centaur Solutions
Corey Hutchison, E.I.T.
Appendix A

Water Calculations and Rationale
Calculations are based on “California Plumbing Code 2019: Adopts with Amendments UPC 2018”. Table 4 was put together using Appendix A “Recommended Rules for Sizing the Water Supply System” of the CPC A103.0 Demand Load and A105.0 Size of Building Supply. Using this rationale, it was determined that the peak demand should be calculated using 3319 fixture units, based on 320 bathtub or combo bath/shr, 10 hose bibbs, 320 lavatories, 10 mob basins, 6 showers, 4 urinals flushometer, 328 water closets flushometer (See Table 4- “Table A103.1 Water Supply Fixture Units CPC”). Using the 3319 fixture units on the x axis of Chart 1- “A103.1 (1) Estimate Curves for Demand Load CPC”, the peak demand can be estimated to be around 450 gpm or more precisely 468 gpm.

Water calculations using the 468 gpm were calculated in Table 5- “Water Calculations”. Using hazen williams and bernoulli’s equations. It was assumed that there was very little head loss through the meter and the backflow however the water softener was assumed to have a pressure reduction of approximately 15 psig. It was also assumed that a hydrant test was performed and that the test showed a consistent static pressure of 85 psig at 1500 gpm, this particular set up will require a pressure regulator valve set at a pressure rating of 80 psig because of Chapter 6 Water Supply and Distribution 608.0 Water Pressure, Pressure Regulators, Pressure Relief Valves, and Vacuum Relief Valves states that pressure entering a building cannot exceed 80 psig.

Water Calculations also showed that a booster pump will be required to deliver approximately 200 gpm of water to floors 5-9 because of a -22 psig pressure drop available for design, however another pressure regulator valve will need to be installed to ensure that the water pressure does not exceed 80 psig after the booster pump.

See Diagram 1 for specifications and placement of equipment.
<table>
<thead>
<tr>
<th>Individual Fixtures</th>
<th>F.U.</th>
<th>Fixtures Added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathtub or Combination BathShwr</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3/4” Bathtub Fill Valve</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Bidet</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Clothes Washer, domestic</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Dental Unit, cuppider</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Dishwasher, domestic</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Drinking Fountain or Water Cooler</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Hose Bibb</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Hose Bibb, each additional</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lavatory</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lawn Sprinkler, each head</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mobile Home, each (Minimum)</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>Sinks, Bar</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Clinic Faucet Sink</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Clinic Flushometer Valve faucet</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Kitchen Sink, domestic</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Laundry Sink</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Service Sink or Mop Basin</td>
<td>1.5</td>
<td>3</td>
</tr>
<tr>
<td>Washup Sink, each set of faucets</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Shower, per head</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Urinal, 1.6 GPF Flushometer Valve</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Urinal, gray than 1.0 GPF Flush V.</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Urinal, flush tank</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Washfountain, circular spray</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Wtr Closet, 1.6 GPF Gravity Tank</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Wtr Closet, 1.6 GPF Flushomr Tank</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Wtr Closet, 1.6 GPF Flushomr Valve</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Wtr Closet, &gt;1.6 GPF Gravity Tank</td>
<td>3</td>
<td>5.5</td>
</tr>
<tr>
<td>Wtr Closet, &gt;1.6 GPF Flushomr Valve</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Fixture Unit Subtotal</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fixture Unit Total</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other Water Requirements</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Existing Water Requirements</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Total Water Requirements</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Approved Meter Size</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Water supply Line Size</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

\[
\text{Gallons Per Minute (GPM)} = 466
\]

\[
\text{Gallons Per Minute (GPM)} = 466
\]

| Total Lengths | Total Lengths | 500 ft. |
Chart 1- A103.1 (1) Estimate Curves for Demand Load CPC

![Chart](image)

Table 5- Water Calculations

<table>
<thead>
<tr>
<th>WATER CALCULATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building Data:</strong></td>
</tr>
<tr>
<td>First Floor Elevation:</td>
</tr>
<tr>
<td>Elevation of highest fixture:</td>
</tr>
<tr>
<td>Maximum Run of Pipe:</td>
</tr>
<tr>
<td>Fixture Height:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>City Data:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrant location/No:</td>
</tr>
<tr>
<td>Hydrant elevation:</td>
</tr>
<tr>
<td>Static Pressure Reading at Hydrant:</td>
</tr>
<tr>
<td>Residual Pressure Reading at Hydrant:</td>
</tr>
<tr>
<td>Test Flow:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Calculation:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>GPM Demand at Building</td>
</tr>
<tr>
<td>Pressure at Building</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Pressure Regulator:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Regulator Setting:</td>
</tr>
<tr>
<td>Pressure Regulator Fall Off Pressure:</td>
</tr>
</tbody>
</table>
### Table 5- Water Calculations (Cont.)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Loss Through Meter</td>
<td>0 psig</td>
</tr>
<tr>
<td>Pressure Loss Through Backflow Preventer</td>
<td>0 psig</td>
</tr>
<tr>
<td>Pressure Loss Through Water Softener</td>
<td>15 psig</td>
</tr>
<tr>
<td>Meter to Highest Fixture (Ft x 4.3 psi/ft)</td>
<td>44.28</td>
</tr>
<tr>
<td>Residual Pressure Required at Furthest Fixture</td>
<td>30 psig</td>
</tr>
<tr>
<td>Pressure Drop Available For Design</td>
<td>-22 psig</td>
</tr>
<tr>
<td><strong>Pressure Boost</strong></td>
<td><strong>REQUIRED</strong></td>
</tr>
<tr>
<td>Pressure Boost Provided</td>
<td>10 psig</td>
</tr>
<tr>
<td>Pump Discharge Pressure</td>
<td>94.7 psig</td>
</tr>
<tr>
<td>Adjusted Pressure Drop Available for Design</td>
<td>20 psig</td>
</tr>
</tbody>
</table>

- Adjusted Length of Pipe (Maximum Run x 1.35): 270 ft
- Allowable Maximum Friction Loss per 100ft of Pipe: 7.6 psig
- Pressure Drop Available x 100
- Maximum Run of Pipe

<table>
<thead>
<tr>
<th>equivalent pipe length factor</th>
<th>1.35</th>
</tr>
</thead>
</table>

(Increase factor if large quantity of offsets or fittings are used)

### Diagram 1- Specifications and placement of equipment

- **M**: Meter
- **BF**: Backflow
- **PA**: Pressure Assembly
- **BP**: Booster Pump

- 1: Fitness Locker - 6 SH, 4 LA, Lobby - 8 WC, 6 LA, 4 UR
- 2: 
- 3: 
- 4: 
- 5: 
- 6: 
- 7: 
- 8: 

- Dimensions:
  - 8 ft = 2
  - 9 ft = 3
Appendix B

Fire Demand and Rationale
Workload Narrative

Done by April 6th, 2021
**Recommended Meter**
Recommended Backflow Preventer

Series 009
Reduced Pressure Zone Assemblies
Sizes: ¼" – 3" (8 – 80mm)

Series 009 Reduced Pressure Zone Assemblies are designed to protect potable water supplies in accordance with national plumbing codes and water authority requirements. This series can be used in a variety of installations, including the prevention of health hazard cross connections in piping systems or for containment at the service line entrance.

This series features two in-line, independent check valves, captured springs and replaceable check seats with an intermediate relief valve. Its compact modular design facilitates easy maintenance and assembly access. Sizes ¼" – 1" (8 – 25mm) shutoffs have tee handles.

Features
• Single access cover and modular check construction for ease of maintenance
• Top entry - all internals immediately accessible
• Captured springs for safe maintenance
• Internal relief valve for reduced installation clearances
• Replaceable seats for economical repair
• Bronze body construction for durability ¼" – 2" (8 – 50mm)
• Fused epoxy coated cast iron body 2½" and 3" (65 and 80mm)
• Ball valve test cocks — screwdriver slotted ¼" – 2" (8 – 50mm)
• Large body passages provide low pressure drop
• Compact, space saving design
• No special tools required for servicing

Specifications
A Reduced Pressure Zone Assembly shall be installed at each potential health hazard location to prevent backflow due to backspagination and/or backpressure. The assembly shall consist of an internal pressure differential relief valve located in a zone between two positive seating check modules with captured springs and silicone seat discs. Seats and seat discs shall be replaceable in both check modules and the relief valve. There shall be no threads or screws in the waterway exposed to line fluids. Service of all internal components shall be through a single access bronze cover secured with stainless steel bolts. The assembly shall also include two resilient seated isolation valves, four resilient seated test cocks and an air gap drain fitting. The assembly shall meet the requirements of: USC Manual 8th Edition; ASSE Std. 1013; AWWA Std. C511; CSA B64.4. Shall be a Watts Regulator Co. Series 009.

†Does not indicate approval status. Refer to Page 2 for approved sizes & models.

WATTS®

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WattsBox Insulated Enclosures.
For more information, send for literature ES-WB.

IMPORTANT: INQUIRE WITH GOVERNING AUTHORITIES FOR LOCAL INSTALLATION REQUIREMENTS
**Recommended Pressure Regulator Valve**

**Series LF223, LF223S**

**High Capacity Water Pressure Reducing Valves***

**Sizes:** ¼” – 2½”

Series LF223 and LF223S High Capacity Water Pressure Reducing Valves are designed to reduce incoming water pressure to a sensible level to protect plumbing system components and reduce water consumption. The LF223/LF223S features Lead Free® construction to comply with Lead Free® installation requirements. This series is suitable for water supply pressures up to 300 psi (20.7 bar) and may be adjusted from 25 – 75 psi (172 – 517 kPa). The standard setting is 50 psi (345 kPa). Series LF223 features an enlarged diaphragm, spring cage and seat orifice for high capacity performance. Series LF223S has the same options as the LF223, except it is furnished with a strainer. All parts are quickly and easily serviceable without removing the valve from the line. The optional bypass feature permits the flow of water back through the valve into the main when pressures, due to thermal expansion on the outlet side of the valve, exceed the pressure in the main supply.

**Features**

- Enlarged diaphragm, spring cage and seat orifice for super capacity performance
- Lead Free® brass body construction (except 2½” which is iron)
- Serviceable in line
- Series LF223S furnished with separate strainer
- Optional bypass feature controls thermal expansion pressure***
- Sealed spring cage on all models for accessible outdoor or pit installations

**Models**

- LF223: NPT threaded female inlet x NPT threaded female outlet
- LF223S: NPT threaded female inlet with strainer x NPT threaded female outlet

For 2½” – 3” bronze threaded valves, refer to literature ES-LFN223B. For 3” flanged connections, refer to literature ES-LFN223F.

*The wetted surface of this product contacting by consumable water contains less than 0.25% of lead by weight.

**A water saving test program concluded that reducing the supply pressure from 80-100 psi (551-686 kPa) resulted in a water savings of 30%.

***The bypass feature will not prevent the pressure relief valve from opening on the hot water supply system with pressure above 150 psi (10.3 bar).

**NOTICE**

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.
Recommended Booster Pump

Bell & Gossett

Series e-80
5x5x9.5B
Close Coupled In-Line Centrifugal Pump

DESCRIPTION:
The Series e-80 is a highly efficient, heavy duty, close coupled pump designed for horizontal or vertical in-line mounting. The e-80 is available in stainless steel fitted construction, with flows up to 2500 GPM, heads to 380 feet.

SPECIFICATIONS

FLOW
HEAD
HP
VOLTS
CYCLE
ENCLOSURE
APPROX. WEIGHT
SPECIALS

MATERIALS OF CONSTRUCTION
- Stainless Steel Fitted
- Maximum Working Pressure

PUMP VARIABLE SPEED CONTROL
- Integrated Technologic® Sensors Control (TSC)
- Integrated Technologic® (IT)
- External Input by others
- Pressure Sensor(s)
- Differential Pressure Sensor(s)
- Flow Sensor(s)
- By Others

TYPE OF SEAL
- F Standard Seal w/ Flange Line
- Buna-Carben/Ceramic
- S Stuffing Box construction w/ Flushed Mechanical
- Single Seal (EPR-Fungsi Carbide/Carbon)
- PF Stuffing Box Construction w/ Flushed Packing (Graphite Impregnated PTFE)

Series e-80
5x5x9.5B
1170 RPM

Bell & Gossett

TOTAL HEAD vs. CAPACITY

NPSH vs. CAPACITY