RESOLUTE BAY WATER SUPPLY

WATER & SEWER SERVICING STAGE 1B

ELECTRICAL

NOTE: ITEM NUMBERS 1 TO 47 REFER TO ELECTRICAL DRAWING NO. CD-01-26-R-301

TABLE OF COMPONENT DETAILS

| NO. | NAME/MAKE MODEL/SIZE | DATA | SETTINGS | REMARKS |
|---|---|---|---|---|
| 1 | Space Heater Temro 360 #250-0250 Thermostat Pyrotenax #P1001 | 850W, 120V | 50°F. Adjustable | |
| 2 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 3 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 4 | Combination Meter Socket CEB CAT. #RC1-2100 | c/w 70A 2P Main Service Breaker | - | |
| 5 | Thermostat Thermon Type T2-X2 -WX-L | 25A, 240V Factory Set | 40°F - 90°F | |
| 6 | Thermostat Thermon Type T2-X2 -WX-L | 25A, 240V Factory Set | 40°F - 90°F | |
| 7 | Thermostat Thermon Type T2-X2 -WX-L | 25A, 240V Factory Set | 40°F - 90°F | |

| NO. | NAME/MAKE MODEL/SIZE | DATA | SETTINGS | REMARKS |
|---|---|---|---|---|
| 8 | Space Heater Temro 360 #260-0250 Thermostat Pyrotenax #P1001 | 850W, 120V | 50°F Adjustable | |
| 9 | Thermostat Thermon Type T2-X2-WX-L | 25A, 240V Factory Set | 40°F - 90°F | |
| 10 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 11 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 12 | Thermostat Thermon Type T2-X2-WX-L | 25A, 240V Factory Set | 40°F - 90°F | |
| 13 | Thermostat Thermon Type T2-X2-WX-L | 25A, 240V Factory Set | 40°F - 90°F | |
| 14 | Thermostat Thermon Type T2-X2-WX-L | 25A, 240V Factory Set | 40°F - 90°F | |
| 15 | Space Heater Temro 360 #260-0250 Thermostat Pyrotenax #P1001 | 850W, 120V | 50°F Adjustable | |
| 16 | Thermostat Thermon Type T2-X2-WX-L | 25A, 240V Factory Set | 40°F - 90°F | |
| 17 | Combination Meter Socket CEB CAT. #RC1-2100 | c/w 70A, 2P Main Service Breaker | - | |

| NO. | NAME/MAKE MODEL/SIZE | DATA | SETTINGS | REMARKS |
|---|---|---|---|---|
| 18 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 19 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 20 | Space Heater Temro 360 #260-0250 Thermostat Pyrotenax #P1001 | 850W, 120V | 50°F Adjustable | |
| 21 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 22 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 23 | Htg. Cable Temro 360 #260-0250 Thermostat Pyrotenax #P1001 | 850W, 120V | 50°F Adjustable | |
| 24 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 25 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 26 | Combination Meter Socket CEB CAT. #RC1-2100 | c/w 70A, 2P Main Service Breaker | - | |
| 27 | Space Heater Temro 360 #260-0250 Thermostat Pyrotenax #P1001 | 850W, 120V | 50°F Adjustable | |

| NO. | NAME/MAKE MODEL/SIZE | DATA | SETTINGS | REMARKS |
|---|---|---|---|---|
| 28 | Thermostat Thermon Type T2-X2-WX-L | 25A, 240V Factory Set | $40^{o}F$ - $90^{o}F$ | |
| 29 | Thermostat Thermon Type T2-X2-WX-L | 25A, 240V Factory Set | $40^{o}F$ - $90^{o}F$ | |
| 30 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 31 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 32 | Space Heater Temro 360 #260-0250 Thermostat Pyrotenax #P1001 | 850W, 120V | $50^{o}F$ Adjustable | |
| 33 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft | - | |
| 34 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 35 | Combination Meter Socket CEB CAT. #RC1-2100 | c/w 70A 2P Main Service Breaker | - | |
| 36 | Thermostat Thermon Type T2-X2-WX-L | 25A, 240V Factory Set | $40^{o}F$ - $90^{o}F$ | |
| 37 | Thermostat Thermon Type T2-X2-WX-L | 25A, 240V Factory Set | $40^{o}F$ - $90^{o}F$ | |

| NO. | NAME/MAKE MODEL/SIZE | DATA | SETTINGS | REMARKS |
|---|---|---|---|---|
| 38 | Space Heater Temro 360 #260-0250 Thermostat Pyrotenax #P1001 | 850W,120V | 50°F Adjustable | |
| 39 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 40 | Space Heater Temro 360 #260-0250 Thermostat Pyrotenax #P1001 | 850W, 120V | 50°F Adjustable | |
| 41 | Panel "P" (12 CCT.) FPE CAT.# NALP12-3L | 100A Main Lugs 240V, 1Ø, 3 Wire | - | c/w 12 - 15A, 1P Branch Breakers |
| 42 | Space Heater Temro 360 #260-0250 Thermostat Pyrotenax #P1001 | 850W, 120V | 50°F Adjustable | |
| 43 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft | - | |
| 44 | Htg. Cable Thermon Econotrace Type A | 4 Watts/Ft. | - | |
| 45 | Panel "L" (12 CCT.) FPE CAT.# NALP12-3L | 100A Main Lugs 240V, 1Ø, 3 Wire | - | c/w 8 - 15A, 1P & 2-20A, 1P Branch Breakers |
| 46 | Panel "M" (12 CCT.) FPE CAT.# NALP12-3L | 100A Main Lugs 240V, 1Ø, 3 Wire | - | c/w 10 - 15A, 1P & 2-20A, 1P Branch Breakers |
| 47 | Panel "N" (12 CCT.) FPE CAT.# NALP12-3L | 100A Main Lugs 240V, 1Ø, 3 Wire | | c/w 12-15A, 1P Branch Breakers |

# CHAPTER 6 - OPERATING PROCEDURES

## 1 SYSTEM OPERATION - GENERAL

### General

Treated water above 47°F (8.3°c) is pumped into the Town distribution system by the utilidor circulation pumps located in water treatment plant. The continuously circulating water carries sufficient heat to prevent freezing under normal operating conditions.

A sanitary sewer runs parallel with the water main and discharges into the Bay. No real waste treatment is provided at present with the exception of comminution for solids size reduction, located in the last section of the sewer line.

Both water and sewer lines are insulated and electrically heat traced under dual (high and low limit) type thermostatic control to prevent freezing under abnormal operating conditions. The dual thermostat low limit is set to bring the cable on below 35°F (1.7°c) line temperature and the high limit is set to de-energize the cable at a cable sheath temperature above 90°F (32.2°c) to protect the cable and PE pipe from overheating.

Refer also to Chapter 3 - Design Data, regarding facility design parameters used, special built-in features and accepted risks.

### Treated Water Distribution

A series of shut off valves in the water distribution system provides flexibility in the control of water flow. Individual sections of the system can be isolated for inspection, repairs, etc. All valves are located inside electrically heated chambers or vaults.

Fire hydrants located on top of pre-selected vaults provide adequate firewater coverage throughout the town site.

A sump pump facility is provided in each vault so that the vault can be readily dewatered into the sewer line when an appreciable quantity of water accumulates on the vault floor.

The vaults with permanently installed sump pumps are dewatered automatically by the use of level switches. A portable sump pump can be hooked up in all the other vaults and the dewatering carried out manually and/or automatically from then on.

The distribution system electrical heat tracing is divided into a number of sections, each section being controlled individually by a dual type thermostat. The temperature sensing bulbs are located outside the vaults in close proximity to the pipe and cable by inserting them in capillary tubes.

Small quantities of treated water are piped from the water main into the sewer line at the start of each sewer pipe run to assist the sewer waste flow, and to provide a minimum sewer line flow to avoid reliance on the heating cables for freeze protection.

All dead ends of water main are furnished with recirculation pipes installed inside the water main ensuring sufficient water circulation through the section to prevent freezing.

House or Building Services

Water is delivered to each dwelling from the main by a 3/4" pipe enclosed in an insulated pipe bundle also containing a 4" diameter sewer pipe and a 3/4" water return line.

Constant circulation of water is created in the house service lines by utilizing the velocity of water in the mains with "pit orifice" fittings.

All dwellings with service lines in excess of 70' or those connected to the dead end sections of the water main where water velocities are small are furnished with circulation pumps since the "pit orifice" method here would not be effective.

All house water service lines can be isolated from the water main by service valves installed at the header.

The service bundle enters each dwelling through an insulated service box containing a sanitary sewer clean-out.

Each dwelling is also provided with a pressure reducing valve to limit the water pressure to 50 psi inside the dwelling regardless of the water main pressure.

A Neptune Trident water meter records the amount of water used by each uni

Sewage Collection & Disposal

A 6" increasing to 8" sanitary sewer system collects all the waste from the town site and discharges into Resolute Bay.

The sewer system originates at Access Vault No. 2 which is the highest point of the system and gradually drops down to sea level at the bay outfall. A sump receives the water storage reservoir overflow line and drains it to a surface discharge at that location. This can also be used to drain the reservoir and plant piping in emergencies. Provisions are made to allow this surface drain to be extended to AV 2 in the future if desired.

A number of clean-outs in the sewer system, located in the heated vaults permit rodding of the whole system in case of blockage. The clean-outs also receive the vault sump pump discharge piping and a valved vent to allow testing for sewer line surcharging prior to opening clean-out covers.

The sewer system is electrically heat traced throughout its entire length, the heating cables being energized by a series of dual type thermostats, each thermostat controlling a section of the system. Similar to the water mains, the temperature sensing bulbs are located outside the vaults in close proximity to the pipe and cable by inserting them in capillary tubes.

Just before the sewer discharges into Resolute Bay the pipe enters a communitor building, where an inline communitor reduces size of solids discharged into the bay. Also within the communitor building a Parshall Flume and a float operated flowmeter measure the quantity of effluent discharged into the bay.

The communitor and the Parshall Flume can be by-passed totally, the waste being diverted into the outfall line. Both communitor and the Parshall Flume are also provided with an overflow line to automatically overflow and prevent flooding of the communitor building in case of blockage of flow through either piece of equipment.

## 2. START-UP PROCEDURES

### General

As one portion of the system is dependent on the operation of the other portions and vice-versa, the start-up procedure after full shut-down and drainage of the entire water and sewer system, including Water Intake and Supply Line, Water Treatment Plan and Water and Sewer Servicing System will be described here under the above headings. If only a portion of the system has been shut down and requires start-up, then the start-up procedure under the applicable heading and other portions referred to there-in should be followed.

Also, there will be no distinction between a "summer" start-up procedure and a "winter" one since much of the system is affected. by shallow depth ground temperatures, which, in Resolute, are at or below freezing for essentially the entire year.

Before commencing the procedures as follows, it is essential that, in-so-far as possible, each piece of equipment or component within that portion of the system is made ready to place into operation, checked and given a "trial-run" of sufficiently short duration so as not to cause damage,where applicable. Refer to the manufacturer's operating instructions in this regard for each unit involved.

### Water Intake and Supply Line Start-Up Procedure

1. The Water Intake Pumphouse "Main Service Entrance Breaker" (Dwg. A-109 Item 1) and the "Water Intake Line Heating Cable Contactor" (Dwg. A-109, Item 8) should have been ON during shutdown to prevent freezing of, and possible damage to the intake line and wetwell. If not, then these should be turned ON for a minimum 48 hour period prior to starting of the supply pump(s).

2. Turn power ON to Water Supply Line Heating Cables for a minimum 48 hour period prior to introducing water into the line by:

   (a) insuring that the Water Intake Pumphouse "Main Service Entrance Breaker" is ON and that the Manual Transfer Switch (Dwg. A-109 Item 2) is in the "Normal" Position.

   (b) turning the Main Service Entrance Breaker ON at the Water Treatment Plant (Dwg. C-110 Item 10) and insuring that "Heating Cable Lighting Panel 'B' (Dwg. C-101 Item 3) main breaker is ON and that the 20A-2P Breaker for Water Supply Line Heating Cable (Dwg. C-110 Item 12) is ON.

   Check "Mini-Power Centre" main and branch breakers and heating cable thermostat settings and pilot lights on posts along Water Supply Line (Dwg. B-108 Items 4, 8, 11, 14 & 17) to insure that they are ON.

3. Turn "Lighting Panel" main and branch breakers ON (Dwg. A-109 Item 9).

4. Switch Supply Air Fan Starter (Dwg. A-109 Item 4) to "Auto" position.

5. Insure that the fuel system is charged and ready for operation, that the boiler system chemical treatment pot feeders are charged and that boilers and burners are ready for operation by firing up each burner for a few seconds. Insure that the emergency generator unit is ready for operation by switching the Main Service Entrance Breaker OFF for a period of time and allowing the unit to automatically take over the supply of power, and then automatically revert back to normal power after the Main Service Breaker is turned back ON.

6. Close pump discharge valves 4A and 5A and insure that discharge bypass valves 6A and 7A are closed. All other valves should be in "normal" position. (Refer to "Intake Pumphouse Raw Water Supply" Schematic in Chapter 4 of that manual.)

7. Close valves 2C, 8C and 20C at the Water Treatment Plant to prevent water from entering the distribution mains at this stage. Insure that all other valves at the Water Treatment Plant are in their "normal" position at this stage. (Refer to "Treated Water Supply" Schematic in Chapter 4 of the Water Treatment Plant Manual.)

8. Manually start-up one supply pump for a minimum duration by placing Supply Pump Motor Starter on "Hand" position (Dwg. A-109 Item 5 or 6) to allow water charging of the boiler water system. Water should be allowed to pass through the boiler heat exchangers and dump into the wet-well during this time so that the pump is not operating under full shut-off head. (Refer to "Hot Water Loop" Schematic in Chapter 4 of the Water Intake Pumphouse Manual). Once the hot water system is filled and air is vented, the supply pump should be switched off and the boilers and one Heating Circulator (P-3 or P-4) switched ON and allowed to start heating the building and wet-well. Temporary building heat may be required, at the Water Intake Pumphouse for some period prior to charging the boiler system to prevent pipe freezing during the filling process, and at the Water Treatment Plant for some period prior to receiving pipeline flow to prevent pipe freezing there. At this stage, the Water Treatment Plant chlorination system should be charged and made ready for automatic operation.

9. Once the boiler heating system venting is complete and the heating system is operating properly with the building and wet-well up to set temperature, then one supply pump should again be turned ON manually and valves 4A and 5A slowly fully opened to allow water to start passing into the supply line. Once flow has occurred at

a steady rate for a period of time, as can be observed on the Flow Indicator (Dwg. P-102 Item 4, and Dwg. A-105 Plan) then both pumps should be switched to the "automatic" position, and the Reservoir allowed to fill completely and automatically shut off the Supply Pump.

10. Check that all valves and switches are in their "normal" operating position and observe the system operation more closely during the initial period of operation to insure that all components are functioning properly. Once the system has functioned properly over the initial period, normal operation procedures should be followed.

11. Once the water and sewer servicing system is in full operation, with pumping occurring on a regular basis to meet normal water demand, the Intake Line Heating Cable should be switched OFF.

Water Treatment and Storage Plant Start-Up Procedure

1. Turn power ON to all water and sewer main and sewer outfall heating cables for a minimum 48 hour period prior to introducing any water into the mains. This is accomplished by switching ON all power-pole-mounted Main Service Breakers feeding Heating Cable Lighting Panels within access vaults and the Comminutor Building and by siwtching ON all Heating Cable Lighting Panel main and branch breakers inside the vaults and Comminutor Building. Location of Main Service Breakers and Lighting Panels feeding heating cables are shown on Drawing D-300 for Stage 1A and R-301 for Stage 1B.

   Insure that the "Water Treatment Plant Main Service Entrance Breaker" (Dwg. C-110 Item 10) and "Heating Cable Lighting Panel 'B' main and branch breakers (Dwg. C110 Item 3) are all ON.

Also, insure that the main and branch breakers of the outfall Sewer Line Heating Cable Panelboard located in the Comminutor Building (Dwg. B-108 Item 19) and ON, and that the main and branch breakers of the post mounted "Mini Power Centre" and heating cable thermostat pilot lights (Drawing B-108 Items 23 and 20) for the Sewer Outfall Line are all ON.

Check all thermostat settings and pilot light indication to insure proper operation.

2. Insure that the two watermain drains and all hydrants (top-nut) within the distribution system (see Dwg. R-201 for location) are closed.

3. Check operation of Comminutor by manually switching it ON and OFF on wall mounted switch, and check in general to insure that the station is ready for operation. Check Sewage Outfall discharge to insure that it is not frozen off. Check all sewer mains by removing cleanout covers and inspecting to insure there are no blockages due to freezing.

4. Insure that Water Treatment Plant Lighting Panel main and branch breakers are ON (Dwg. C-110 Item 5).

5. Switch Supply Air Fan starter (Dwg. C-110 Item 7) to "auto" position.

6. Insure that the Water Treatment Plant fuel system, boilers burners and emergency generator unit are all ready for operation as described under "Water Intake and Supply Line Start-up" Item 5.

7. By this stage it is assumed that the Water Intake Pumphouse and Supply Line has been started-up to the point where the Water Storage Reservoir is full, in accordance with the procedure

described previously for the Water Intake Facility (i.e. up to and including Step (9) with temporary heat being provided within the Treatment Plant as required, and all valves at the Water Treatment Plant in the position as called for previously at this stage.

8. Start-up one Water Main Circulation Pump ("Utilidor" Circulation Pump P1 or P2) by switching its starter to the ON position (Dwg. C-110 Item 1 or 2) to allow water charging of the boiler water system. Treated water should be allowed to pass through the boiler heat exchangers through the self-regulating temperature control valve 80C and back to the suction side of the pumps and also back into the Water Storage Reservoir through the temperature control valve 84C so that the pump is not operating under full shut-off head. (Refer to "Hot Water Loop" Schematic and Treated Water Supply" Schematic in Chapter 4 of the Water Treatment Plant Manual.) Once the boiler water system is filled and air is vented, the boilers and one Heating Circulator (P-3 or P-4) should be switched ON and allowed to start heating the building and Water Storage Reservoir.

9. Once the boiler heating system venting is complete and the heating system is operating properly with the building and Water Storage Reservoir up to set temperature, the Water Main Circulation Pump should be switched OFF. Valve 17C should then be closed fully, then valve 2C partially opened slowly to allow reservoir water to flood the distribution mains from the Supply Main side, while at the same time air is vented up the Return Main side and into the Reservoir at a controlled rate by partially opening valve 17C slowly. Once the mains have been flooded, as is discernable by the stoppage of the sound of water and air flow, fully open valves 2C and 17C. At this stage, all hydrants and services within the distribution system should be vented of air and

all building services should be allowed to bleed slowly within buildings, to waste, until circulation has been restored within the water service lines. Turn on Comminutor at this stage. Also vent all high point piping vents within the Water Treatment Plant at this stage.

10. As soon as possible after air venting of the distribution system, open fully valves 8C and 29C, (all valves in the Water Treatment Plant should now be in their "normal" operating positions) and switch ON one of the Water Main Circulation Pumps, one of which is to remain running essentially on a continuous basis so long as there is water is the distribution system.

    Check for correct circulation flow rate and heating operation at the Water Treatment Plant and carry out further air venting of both the hot water heating system and the treated water circulation system.

11. Prior to eliminating water service line bleeding, insure that circulation has been restored in all water services either by means of the pit-orifices provided or by means of the water service circulation pumps where provided. Measuring water tap temperature after an approximate four hour period of no draw and comparing this with water main temperature will give an indication, as it should be within $3^{o}F$ ($1.7^{o}C$) at coldest outdoor conditions. Adjust all vault bleeds and the "minimum flow bypass" to a flow of approximately 2 gpm. (See Drawing R-201 for locations.)

12. Check that all valves and switches are in their "normal" operating position and observe the system operation more closely during the initial period of operation to insure that all components are functioning properly. Once the system has functioned properly over the initial period, normal operation procedures should be followed.

## Water and Sewer Servicing System

As the Water and Sewer Servicing System start-up must be carried out in conjunction with the Water Treatment and Storage Plant start-up (for freeze protection, etc.) the above start-up description for the Water Treatment and Storage Plant also includes start-up procedures required relative to the Water & Sewer Servicing System. The above Step (12) for the Water Treatment Plant is also applicable to the Water and Sewer Servicing System, including the Comminutor Station and main sewage outfall.

## Draining of Water Distribution System

The entire distribution system or portions between main valves can be drained for emergency protection against freezing or for servicing, etc. first by opening of the hydrants and then by use of the two low point main drains, where pumping would be required to drain the remaining portion below top-of-vault level at that location.

Water can be maintained in the Reservoir when the mains are drained by closing valves between the Reservoir and the mains at the Water Treatment Plant. When these valves are closed, care must be taken to allow vacuum relief (or air to enter) at the top end of both the water supply and return mains prior to any draining of the mains. Vacuum relief is required to assist the draining process and to avoid excessive negative pressures at the upper ends of the polyethylene pipe mains, as would be caused by draining at the lower end while the upper end is closed off.

To safely drain the mains while maintaining water in the reservoir (assuming starting with all valves in their normal operating position) proceed as follows:

1. Shut down the operating Main Circulation Pump (so that both are off).

2. Close valve 29C then 4C.

3. Open valve 3C which will allow air to enter the upper ends of the mains when draining.

4. Drain mains to the level required. (Further vacuum relief, if required for further draining, can be accomplished at a lower level, i.e. by opening a hydrant, once the mains are drained to below that level).

Circulation and heating of the Reservoir can now be resumed, if required prior to re-filling the mains, as follows:

1. Close valve 2C and 8C.

2. Partially close valve 3C.

3. Open valve 4C and fully close valve 3C once the air in the same line (suction line of the pump) has been vented through valve 3C.

4. Start-up one Water Main Circulation Pump, which will provide circulation and heating of the Reservoir.

5. To place the mains back into operation, (once the previously discussed steps applicable to their start-up have been taken), proceed with Steps 9 through 12 under the previously discussed Water Treatment Plant Start-up.

Volume-3

Water and Sewer Services Systems Resolute Bay

NOTE:

1. ITEM NUMBERS SHOWN THUS (6)
2. TAG NUMBERS SHOWN THUS (12D)
3. ALL SEWER MAINS ARE 6" EXCEPT 8" WHERE SHOWN.
4. ALL VALVES ARE NORMALLY OPEN EXCEPT NORMALLY CLOSED WHERE SHOWN 'N.C.'
5. SEE DWG. # D-300 & R-301 FOR SEWER MAINS HEAT TRACING.
6. SEE NOTE 7 & 8 ON "TREATED WATER SCHEMATIC" RE: POLYETHYLENE PIPE MATERIAL.