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AQUATHERM HOT TAP METHOD

EQUIPMENT:

1. McElroy Hornet, accessories and instructions
2. Hornet pressure adapter assembly
3. Hot tap tool package with appropriate heater adapters (welding heads) for hot tap welding
 - a. Initial set includes: 2x1, 2½x1, 3x1, 4x1, 4x2, 6x2, 8x2 and 10x2
4. Socket heater kit (preferably two, one for hot tap, one for socket fusion of valve assembly)
5. Surface or infrared thermometer, pyrometer
6. Strap wrench
7. Spanner wrench
8. ½" socket wrench or drill

RANGE OF SIZES FOR HOT TAPPING:

1. Main 2-in. (63mm) to 10-in. (250mm)
Note: Larger main sizes may be accommodated via special request to Aquatherm and written authorization.
2. Branch 1-in. (32mm) to 2-in. (64mm)
Note: Branch sizes are limited to the same sizes available for fusion outlets.

WARNING: HOT TAPPING SHALL NOT BE DONE ON PIPE CONTAINING COMPRESSED AIR OR OTHER COMPRESSED GASES. Failure of a compressed gas (air or other gas) system can be extremely violent and dangerous. In a compressed gaseous media test or piping system, energy is applied to compress the gaseous media in addition to pressurizing the system. If failure occurs, both energies can be suddenly released and can be extremely violent compared to failure during leak testing or system operation with an incompressible liquid testing media. Conducting a hot tap on a main pressurized with compressed gas may damage the tool, cause catastrophic rupture of the piping, and cause injury or death to the operator or other personnel in the vicinity.

WARNING: HOT TAPPING SHALL NOT BE DONE IF THE MAIN PIPE HYDROSTATIC (WATER) PRESSURE EXCEEDS THE RATING OF THE HOT TAP TOOL (165 psig). Conducting a hot tap on a main with pressure exceeding the rating of the hot tap tool may damage the tool, cause catastrophic rupture of the piping, and cause injury or death to the operator of the equipment.



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DISCLAIMER: This procedure is provided as an aid to the user of the hot tapping equipment. The procedure and materials described herein are not intended to be a substitute for proper training of the individual(s) performing the hot tap procedure. To schedule training for use of the hot tap equipment, contact your Aquatherm Regional Sales Manager.

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The full Aquatherm warranty will continue to apply to the Aquatherm pipe, fittings and valves in the system as stated in the Aquatherm warranty documentation available at www.aquatherm.com/warranty.



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PROCEDURE

1. Equipment Preparation

- a. When reference is made to a piece of equipment such as a drill, Hornet, or heater, follow the manufacturer's instructions for proper set-up, safety precautions, and operation of the equipment.
- b. Ensure all equipment is in proper operating order and readily accessible prior to beginning the hot tap procedure.
- c. Attach the correct size heater adapters/welding heads to the heater plate and begin heating. Welding head size is based on both the main pipe and the branch to be attached.
 - i. The welding heads must be aligned properly with the marks on the heater to ensure correct alignment when doing the hot tap. This is critical because the hot tap fitting cannot be rotated once it is attached to the Hornet.
- d. Attach the correct size "puck" to the load cell of the Hornet.
- e. Install the load cell in the Hornet. Verify that the load cell is functioning. If the load on the gauge does not increase when force is applied, the load cell may need more hydraulic fluid.
- f. Identify the location on the main pipe where the hot tap is to be done, and ensure that there is sufficient space around the location to attach and operate the Hornet and hot tap tool.
- g. Verify the hydrostatic (water) pressure in the main, at the hot tap location, is below the rating of the hot tap tool (HTT) (<165 psig).**
- h. Remove any dirt, dust, insulation materials and adhesive, and any other residue or contaminants from the pipe surface at and around the location of the hot tap.
 - i. Confirm the heater and welding heads are at the correct temperature ($500\pm 18^{\circ}\text{F}$, $260\pm 10^{\circ}\text{C}$) using an infrared pyrometer (heads only, aluminum heater will not give accurate reading on IR thermometer) or contact thermometer (heater and heads).

2. Pipe preparation

- a. Clean the pipe in the area of the intended hot tap, completely removing any residual paints, adhesives, insulation or other materials that could interfere with proper fusion. Chilled water piping may sweat while preparing to do the fusion. The surface should be dry and clean at the time the fusion process is started. Securely attach the Hornet to the pipe, aligned to accommodate the hot tap location. A level should be used to aid in vertical/horizontal/angle of the Hornet before securing to the pipe.
- b. Attach the hot tap fitting to the Hornet, while aligning it on the pipe. The concave portion of the fitting must align with the pipe OD, and the socket end of the fitting must be flush/square against the load cell plate on the Hornet pressure cylinder.
- c. Tighten the fitting clamp to secure the fitting on the Hornet in the correct orientation.
- d. Raise the fitting clamp to allow space for abrading the fitting and inserting the heater.
- e. Fully abrade the main pipe surface at and around the hot tap location using 50-60 grit emery cloth. Do NOT use sandpaper or other material that can leave small bits of paper and particulates in the pipe surface.
- f. Abrade the concave mating surface of the hot tap fitting using 50-60 grit emery cloth.
- g. Wipe/clean the abraded areas with isopropyl alcohol (IPA).



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3. Fusing the hot tap fitting

- a. Align the heater/welding heads with the pipe and fitting such that the fitting is centered on the welding head with a slight overlap of the welding head surface seen around the circumference of the fitting base.
- b. Using the Hornet gear drive, apply "Heat" pressure for the applicable time as shown in Table 1. The pressure gauge must be monitored, and the pressure maintained manually. Locking the load cell in place using the locking mechanism on the Hornet will not necessarily maintain the correct pressure. The locking mechanism is intended to hold the fitting/clamp/cylinder in place while positioning the Hornet.
- c. Release the pressure to 0 psi for the "Soak" time in Table 1, maintaining positive contact between the welding heads, pipe surface and fitting surface.
- d. During the heat soak phase, continuously monitor the size of the bead around the fusion location, ensuring that an even, complete bead is forming around the welding heads. Depending on the conditions, it may be necessary to increase the heat soak time to ensure a complete and even melt is achieved.
- e. Raise the fitting off the welding head, and remove the heater.
- f. Quickly check the pipe and fitting fusion areas to ensure a complete and even melt pattern on both surfaces. Continue with the fusion process regardless of the quality of the melt.
 - i. If the melt quality was not correct, a new hot tap will need to be done, but this location cannot be used. This fitting must be abandoned, but is fused in place to ensure the integrity of the pipe where the surface was heated properly.
- g. Move the fitting onto the heated pipe surface and apply the "Fusion" pressure for the time given in Table 1. The pressure gauge must be monitored, and the pressure maintained manually. Locking the load cell in place using the locking mechanism on the Hornet will not necessarily maintain the correct pressure.
- h. Disengage the fitting clamp/puck and remove the Hornet from the pipe.



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TABLE 1 - FUSION PARAMETERS

Size	Heat		Soak		Fusion	
	Pressure**, psi	Time***, sec.	Pressure, psi	Time***, sec.	Pressure, psi	Time, min.
2" x 1" — 63 x 32 mm	15	55	0*	25	10	5
2 ½" x 1" — 75 x 32 mm	15	55	0*	25	10	5
2 ½" x 1 ¼" — 75 x 40 mm	30	45	0*	30	15	5
3" x 1" — 90 x 32 mm	15	55	0*	25	10	5
3" x 1 ¼" — 90 x 40 mm	30	45	0*	30	15	5
3 ½" x 1" — 110 x 32 mm	15	55	0*	25	10	5
3 ½" x 1 ¼" — 110 x 40 mm	30	45	0*	30	15	5
3 ½" x 1 ½" — 110 x 50 mm	50	75	0*	45	25	10
4" x 1" — 125 x 32 mm	15	55	0*	25	10	5
4" x 1 ¼" — 125 x 40 mm	30	45	0*	30	15	5
4" x 1 ½" — 125 x 50 mm	50	75	0*	45	25	10
4" x 2" — 125 x 63 mm	80	90	0*	65	40	10
6" x 1" — 160 x 32 mm	15	55	0*	25	10	5
6" x 1 ¼" — 160 x 40 mm	30	45	0*	30	15	5
6" x 1 ½" — 160 x 50 mm	50	75	0*	45	25	10
6" x 2" — 160 x 63 mm	80	90	0*	65	40	10
8" to 10" x 1" — 200 to 250 x 32 mm	15	55	0*	25	5	5
8" x 1 ¼" — 200 x 40 mm	30	45	0*	30	15	5
8" x 1 ½" — 200 x 50 mm	50	75	0*	45	25	10
8" x 2" — 200 x 63 mm	80	90	0*	65	40	10
10" x 1 ¼" — 250 x 40 mm	30	45	0*	30	15	5
10" x 1 ½" — 250 x 50 mm	50	75	0*	45	25	10
10" x 2" — 250 x 63 mm	80	90	0*	65	40	10

* Force should be just sufficient to maintain complete contact between PP surfaces and welding heads When hot-tapping a chilled water line, increase Soak pressure to 20 psi.

** For chilled water lines, increase the pressure by 20-25 psi to achieve proper contact and bead formation.

*** Heat times may be increased up to 50% when hot-tapping a chilled water line to ensure sufficient bead formation and full contact between the heater surface and pipe surface. Soak times should be increased the full 50% for chilled water lines.





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4. Connecting the valve assembly

- a. Chamfer both ends of pipe stubs on the valve pipe assembly. This aids in making the socket fusion on the hot tap fitting and helps provide a good seal and reduce o-ring wear in the hot tap tool on the other end.
 - i. **Note:** Assemblies provided by Aquatherm will have the ends chamfered when shipped.
- b. Disassemble the shorter end of pipe and union nut and set the valve aside.
- c. Ensure the union nut is on the shorter pipe end before fusing.
- d. Fuse the pipe/union nut assembly to the hot tap fitting socket using standard socket fusion equipment, procedures, times, and pressures. A cold-ring tool may be used to aid in proper alignment of the valve assembly. **The ball valve must be installed with the handle pointing away from the main line when in the open position.** This will ensure the removable internal cartridge and ball are on the pressure side of the valve when closed.
- e. **Warning:** The pipe/valve assembly must be the correct length to avoid the hot tap drill bit damaging the interior of the main pipe on the opposite side from the branch.

5. Hot tapping the main

- a. Wait at least 30 minutes after fusing the branch pipe to the main pipe socket fitting before beginning the hot tap procedure.
- b. Re-assemble the valve with the union nut on the branch line.
 - i. If the internal cartridge of the ball valve has become loose, tighten it with a spanner wrench before re-assembly.
 - ii. A strap wrench may be necessary to hold the union nut in place and tighten on the valve to avoid excessive bending or other stress on the branch piping and hot tap fitting.
- c. Ensure the hot tap drill has the correct drill bit connected.
- d. Align the hot tap sleeve next to the pipe end and mark the insertion depth on the pipe stub.
- e. Open the bleed valve on the hot tap sleeve.
- f. Place the safety ring on the pipe stub.
- g. Slide the hot tap sleeve onto the pipe to the insertion depth mark.

Note: Chamfering the pipe end, and lubricating the sleeve o-ring will aid in this process and help avoid damaging the o-rings.
- h. Conduct a hydrostatic test to confirm the hot tap fitting fusion to the main pipe is leak-free.
 - i. Connect a pressure source to the bleed valve of the hot tap sleeve.
 - ii. Open the ball valve and fill the valve assembly with water, bleeding off any air.
 - iii. Apply a minimum 100 psi hydrostatic pressure to the valve assembly for a period of 30 minutes.
 - iv. Close off the supply pressure with the valve assembly pressurized.



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- v. Monitor the pressure and the hot tap weld for any signs of leaks.
- vi. If pressure loss or leaking is observed, abandon this hot tap fitting and begin the process at a new location. Do NOT remove the hot tap fitting from the main pipe.
- i. Open the ball valve and insert the hot tap drill until it contacts the pipe OD.
- j. Mark the shaft of the drill approximately 1.5 inches above the top of the sleeve. This mark will provide guidance in determining when the drill bit has penetrated through the pipe wall.
- k. Close the bleed valve on the hot tap sleeve.
- l. Attach the socket driver or drill to the end of the hot tap drill bit.
Caution: *The operator should stand to the side of the drill bit rather than directly at the end. Upon completion of the drilling process, the bit may rebound outward.*
- m. Drill through the pipe wall. Once the bit has breached the wall, the resistance on the drill bit will lessen, this should be felt by the operator. The internal pressure will also cause the bit to move outward.
Caution: *Do not over-insert the drill bit as this may damage the opposite interior wall of the pipe.*
- n. Ensure the drill bit is retracted outward beyond the ball valve.
- o. Close the ball valve.
- p. Release the internal pressure on the hot tap sleeve by opening the bleed valve. Some air/water will be released in this process.
- q. Remove the drill bit and hot tap sleeve, confirm the material from the pipe wall was retained in the drill bit.
- r. Completely dry interior and exterior of pipe end prior to making next fusion connection.
- s. Inspect all fusion joints and hot tap area for leaks.



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HOT TAP FITTINGS:

Table 2 provides a list of hot tap fittings with part numbers which can be purchased through Aquatherm. The table includes hot tap outlets, hot tap tanks for training purposes, and hot tap valve assemblies. Hot tap valve assemblies are available with brass or polypropylene valves. Polypropylene valve assemblies are to be used for training purposes, and for potable water application. Should installer wish to install a brass ball valve assembly in a potable water system please contact Aquatherm. Brass ball valves listed in Table 2 are for use in heating/chilled water applications and are not to be used in potable water piping systems.

REQUIREMENTS FOR TRAINING

1. A prerequisite for this training is that the trainee must have successfully completed the Aquatherm Master Training for both socket and butt fusion and be actively training others and/or installing Aquatherm piping.
2. The Trainer must demonstrate the HTT on both pipe sizes.
3. Training must be done using live/pressurized pipe samples ("tanks"). The tanks are filled with water, but may be pressurized using either water or air-over-water equipment. In most cases, the building domestic water supply pressure is sufficient for this.
4. Tanks, valve assemblies, and fittings for training can be ordered using the part numbers in Table 2, from orders@aquatherm.com.
5. For training purposes, it is preferable to have two heating irons available, one equipped for the hot tap, and the other for doing the socket fusion with the valve assembly.
6. The trainee must successfully perform at least two hot taps on 2-in. SDR 11 pipe (2x1), and at least two hot taps on 6-in. SDR 7.4 or larger pipe (6x2).
7. Successful hot tapping consists of:
 - a. Proper bead formation on the welds;
 - b. Full removal of the material "plug" after drilling; and
 - c. No leaks once valve closed and tool is removed.



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TABLE 2 – PART NUMBERS FOR HOT TAP FITTINGS (1 of 2)

Item	Description	List Price
8115168	2" X 1" Hot tap outlet	33.08
8115174	2.5" X 1" Hot tap outlet	33.08
8115175	2.5" X 1.25" Hot tap outlet	33.08
8115180	3" X 1" Hot tap outlet	33.08
8115181	3" X 1.25" Hot tap outlet	33.08
8115194	4" X 1" Hot tap outlet	33.08
8115196	4" X 1.25" Hot tap outlet	33.08
8115197	4" X 1.5" Hot tap outlet	35.29
8115198	4" X 2" Hot tap outlet	37.23
8115210	6" X 1" Hot tap outlet	34.05
8115212	6" X 1.25" Hot tap outlet	34.05
8115214	6" x 1.5" Hot tap outlet	37.58
8115216	6" x 2" Hot tap outlet	39.38
8115231	8" X 1.25" Hot tap outlet	35.92
8115232	8" X 1.5" Hot tap outlet	39.79
8115233	8" X 2" Hot tap outlet	41.39
8115230	8-10" X 1" Hot tap outlet	34.74
8115251	10" X 1.25" Hot tap outlet	39.38
8115252	10" X 1.5" Hot tap outlet	40.42
8115253	10" X 2" Hot tap outlet	42.22
8070138TANK	Hot tap tank 10" SDR 17.6 Blue	854.27
8070118TANK	Hot tap tank 2" SDR 11 Blue	238.19
8070120TANK	Hot tap tank 2.5" SDR 11 Blue	259.68
8070730TANK	Hot tap tank 6" SDR 7.4 Green	832.69
8070134TANK	Hot tap tank 8" SDR 17.6 Blue	696.48
8041492SDR11B	Hot tap valve assembly 1" SDR 11Blue	91.21
8041492SDR11G	Hot tap valve assembly 1" SDR 11Green	91.47
8041492SDR7.4	Hot tap valve assembly 1" SDR 7.4	94.33
8041492SDR9	Hot tap valve assembly 1" SDR 9	92.13
8041494SDR11B	Hot tap valve assembly 1.25" SDR 11Blue	104.12
8041494SDR11G	Hot tap valve assembly 1.25" SDR 11Green	104.40



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TABLE 2 – PART NUMBERS FOR HOT TAP FITTINGS - (2 of 2)

Item	Description	List Price
8041494SDR7.4	Hot tap valve assembly 1.25" SDR 7.4	108.58
8041494SDR9	Hot tap valve assembly 1.25" SDR 9	105.86
8041496SDR11B	Hot tap valve assembly 1.5" SDR 11Blue	122.15
8041496SDR11G	Hot tap valve assembly 1.5" SDR 11Green	123.02
8041496SDR7.4	Hot tap valve assembly 1.5" SDR 7.4	130.32
8041496SDR9	Hot tap valve assembly 1.5" SDR 9	124.58
8041498SDR11B	Hot tap valve assembly 2" SDR 11Blue	153.37
8041498SDR11G	Hot tap valve assembly 2" SDR 11Green	154.48
8041498SDR7.4	Hot tap valve assembly 2" SDR 7.4	164.87
8041498SDR9	Hot tap valve assembly 2" SDR 9	156.95
8041312SDR11B	Hot tap Brass Valve Assembly 1" SDR 11Blue	106.7
8041312SDR9	Hot tap Brass Valve Assembly 1" SDR 9Blue	114.36
8041314SDR11B	Hot tap Brass Valve Assembly 1.25" SDR 11Blue	171.18
8041314SDR9	Hot tap Brass Valve Assembly 1.25" SDR 9Blue	181.19
8041316SDR11B	Hot tap Brass Valve Assembly 1.5" SDR 11Blue	277.92
8041316SDR9	Hot tap Brass Valve Assembly 1.5" SDR 9Blue	309.61
8041318SDR11B	Hot tap Brass Valve Assembly 2" SDR 11Blue	444.62
8041318SDR9	Hot tap Brass Valve Assembly 2" SDR 9Blue	483.09

