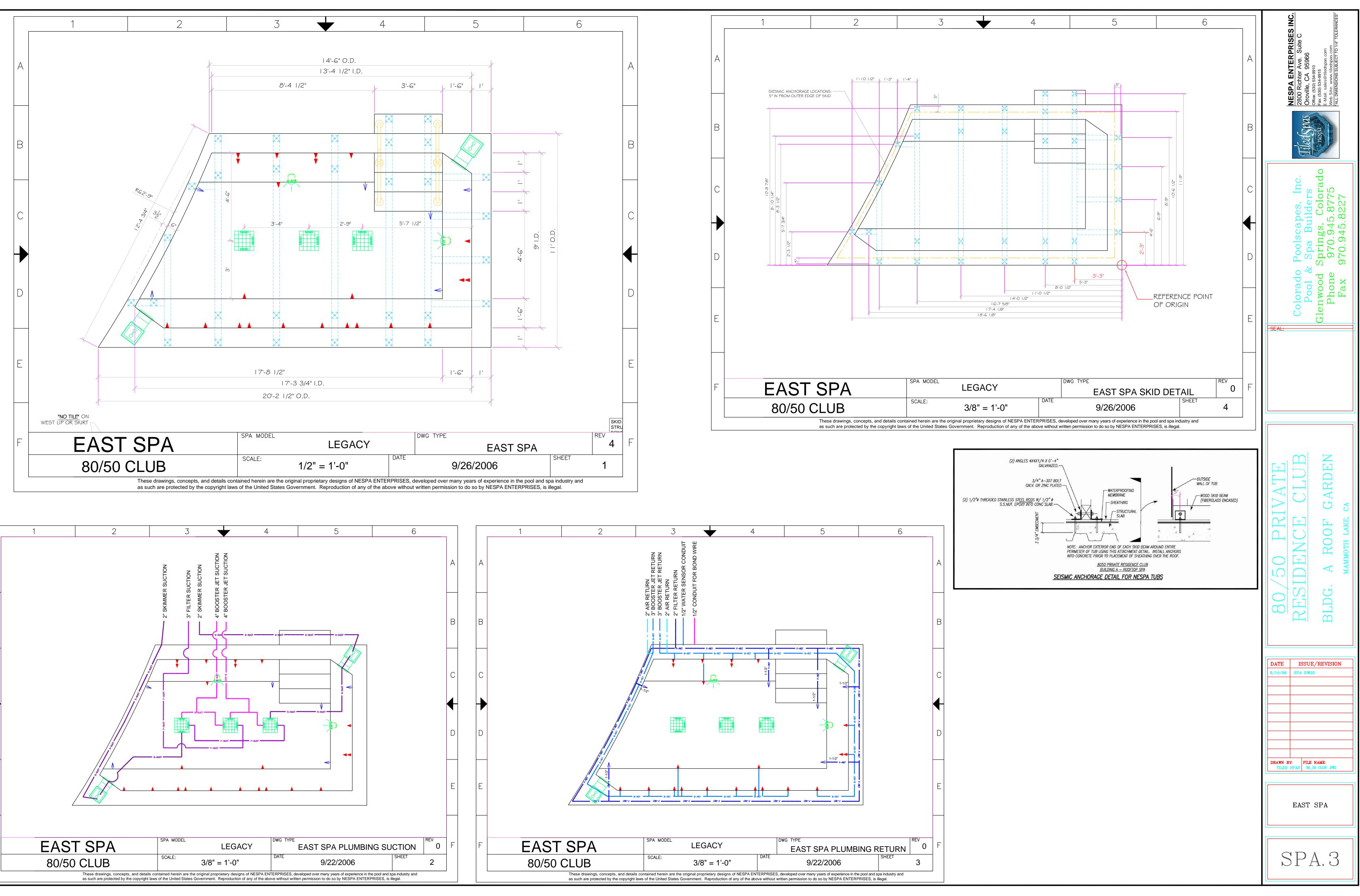
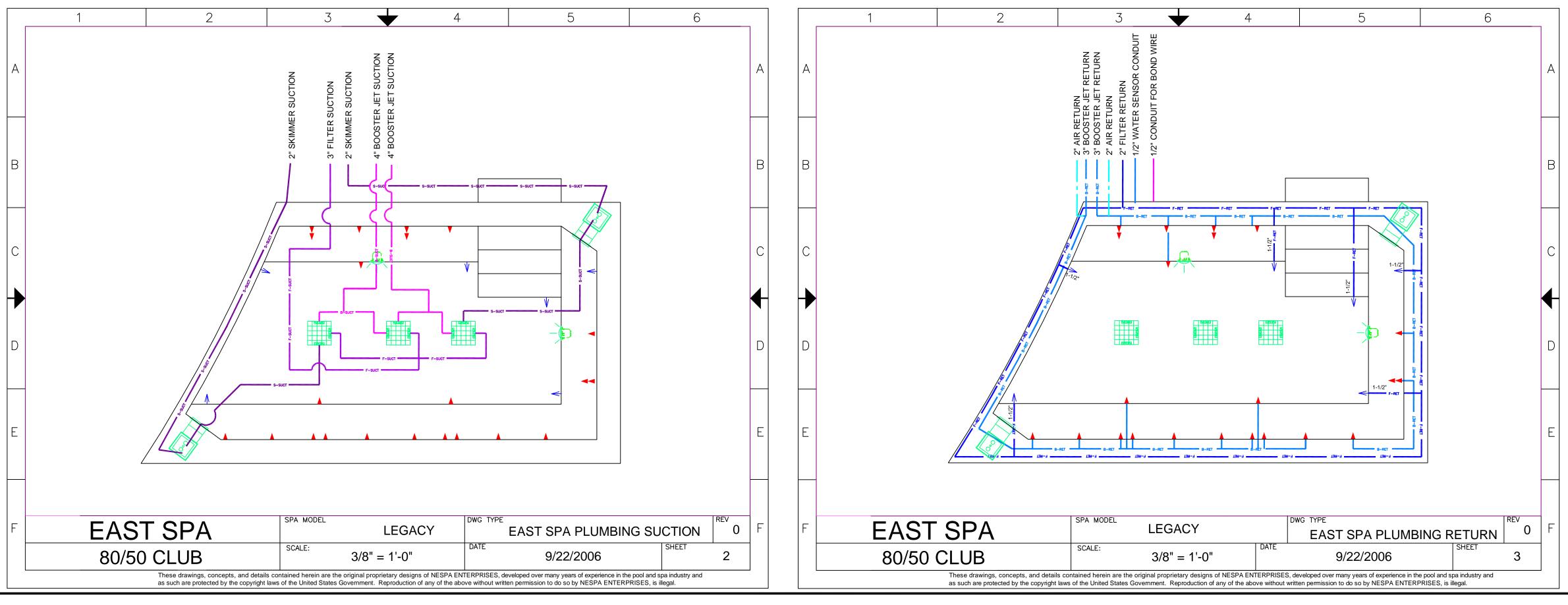
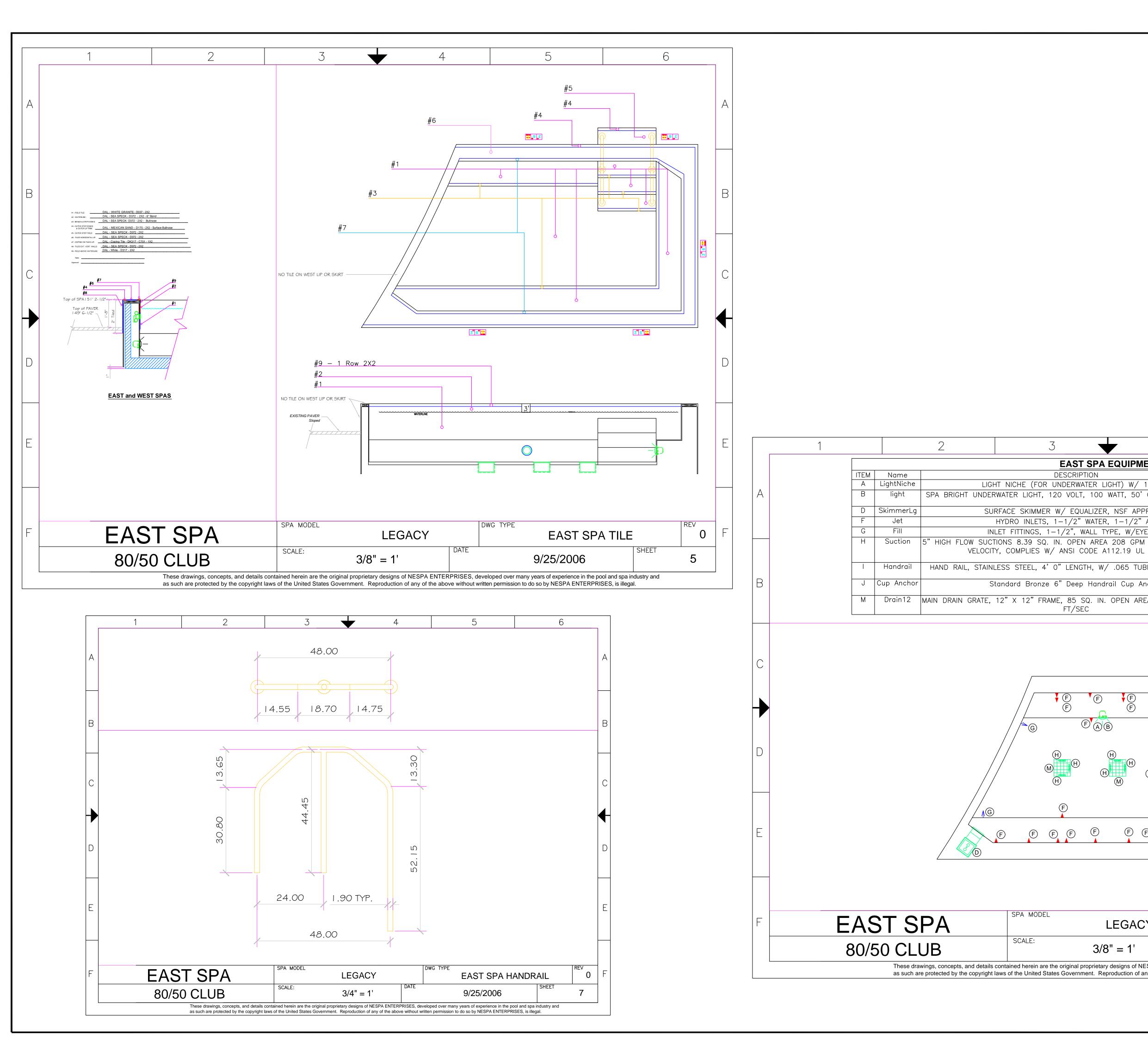


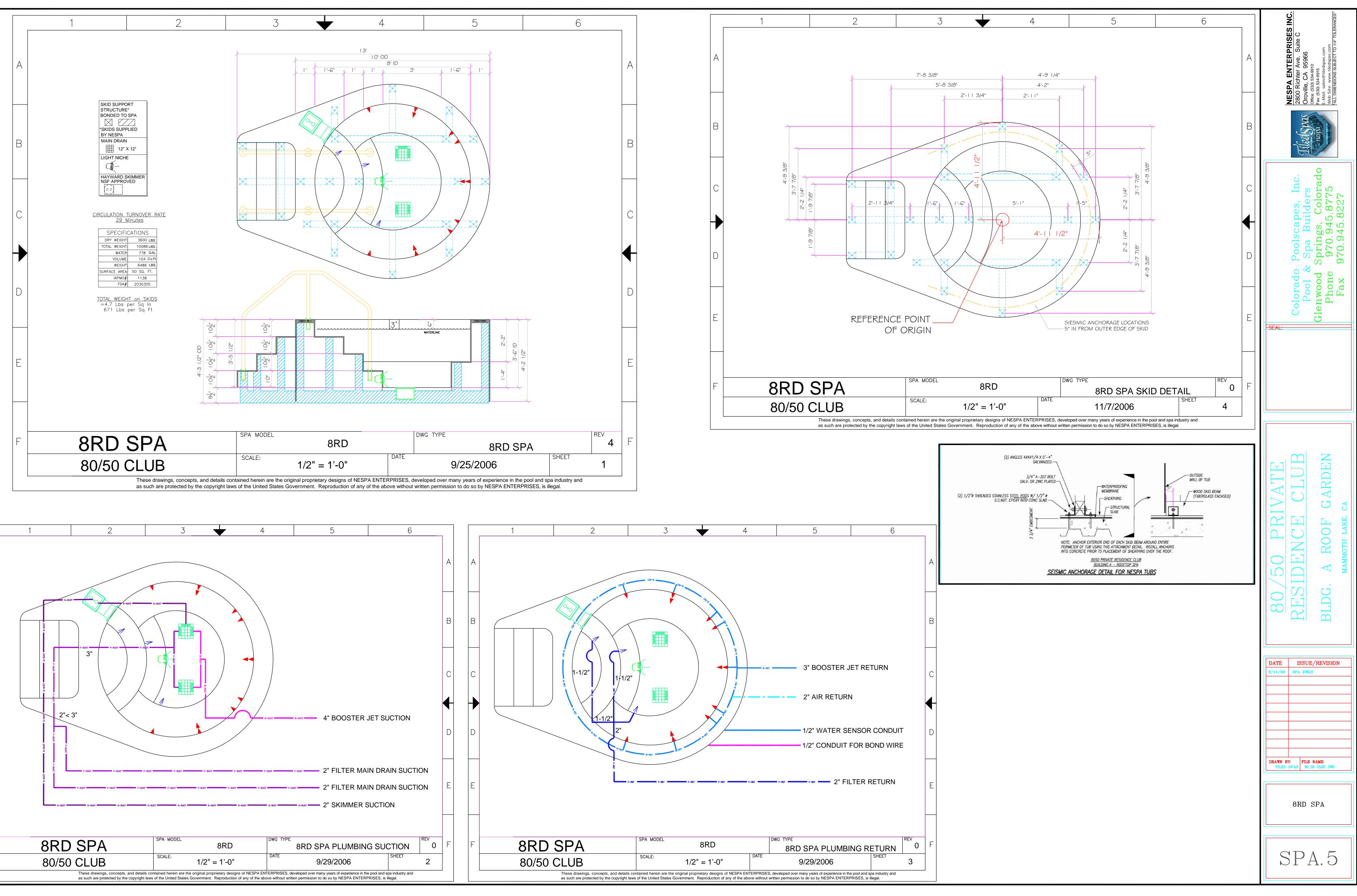
						ItemsColorado Poolscapes, Inc. Pool & Spa Builders Glenwood Springs, Colorado Phone 970.945.8775 Fax 970.945.8277
EQUIPMENT LIST GHT) W/ 1" HUB VATT, 50' CORD, U.L. APPROVED NSF APPROVED 1–1/2" AIR PE, W/EYEBALL 208 GPM AT 1.5 FT/SEC WATER	5 MANUFACTURER PENTAIR/PACFAB PENTAIR/PACFAB HAYWARD HYDRO-AIR HYDRO-AIR WATERWAY	CATALOG NO. 782423 78108100 SP-1084 FVE 10-5100 10-3500 640-3850	Quantity 3 3 2 24 6 9		A	
12.19 UL APPROVED .065 TUBING WALL THICKNESS ail Cup Anchor OPEN AREA, 401 GPM @ 1-1/2	S. R. SMITH S. R. SMITH PAC FAB	2HR-4-065 5764 54-2020	2 6 3		В	DRIVATE CE CLUB OF GARDEN Lake, ca
E A B E F					C T	80/50 PR RESIDENCE BLDG. A ROOF mammoth lake,
					E	DATE ISSUE/REVISION   9/18/06 SPA DWGS   9/18/06 SPA DWGS
DWG     MIRAGE     DATE     8" = 1'     ry designs of NESPA ENTERPRISES, developed	WEST SP/ 9/25/200	6	SHEET	REV 0 6	F	WEST SPA
eproduction of any of the above without written pe	rmission to do so by NESPA	ENTERPRISES, is ille	gal.			SPA.2

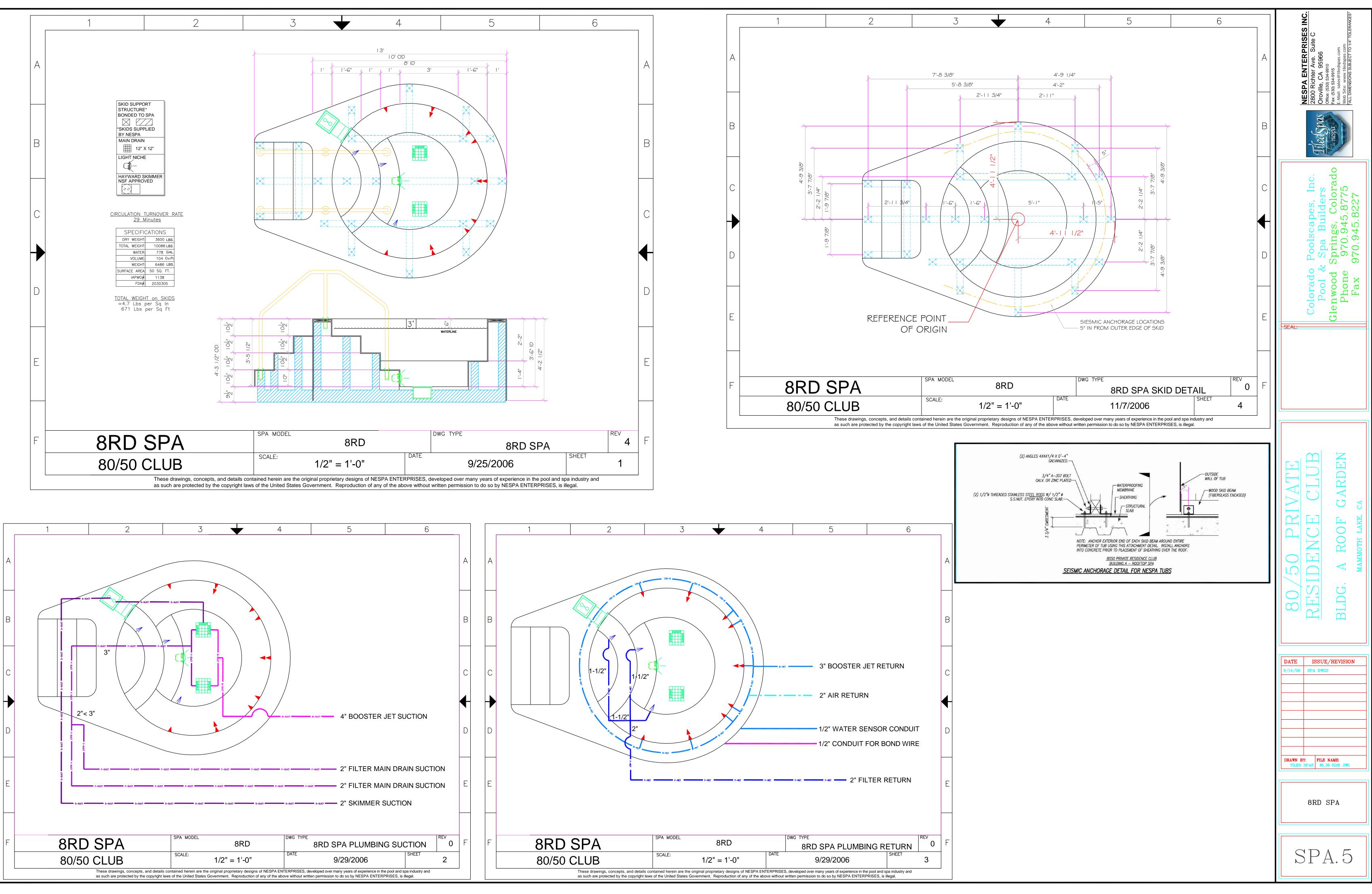


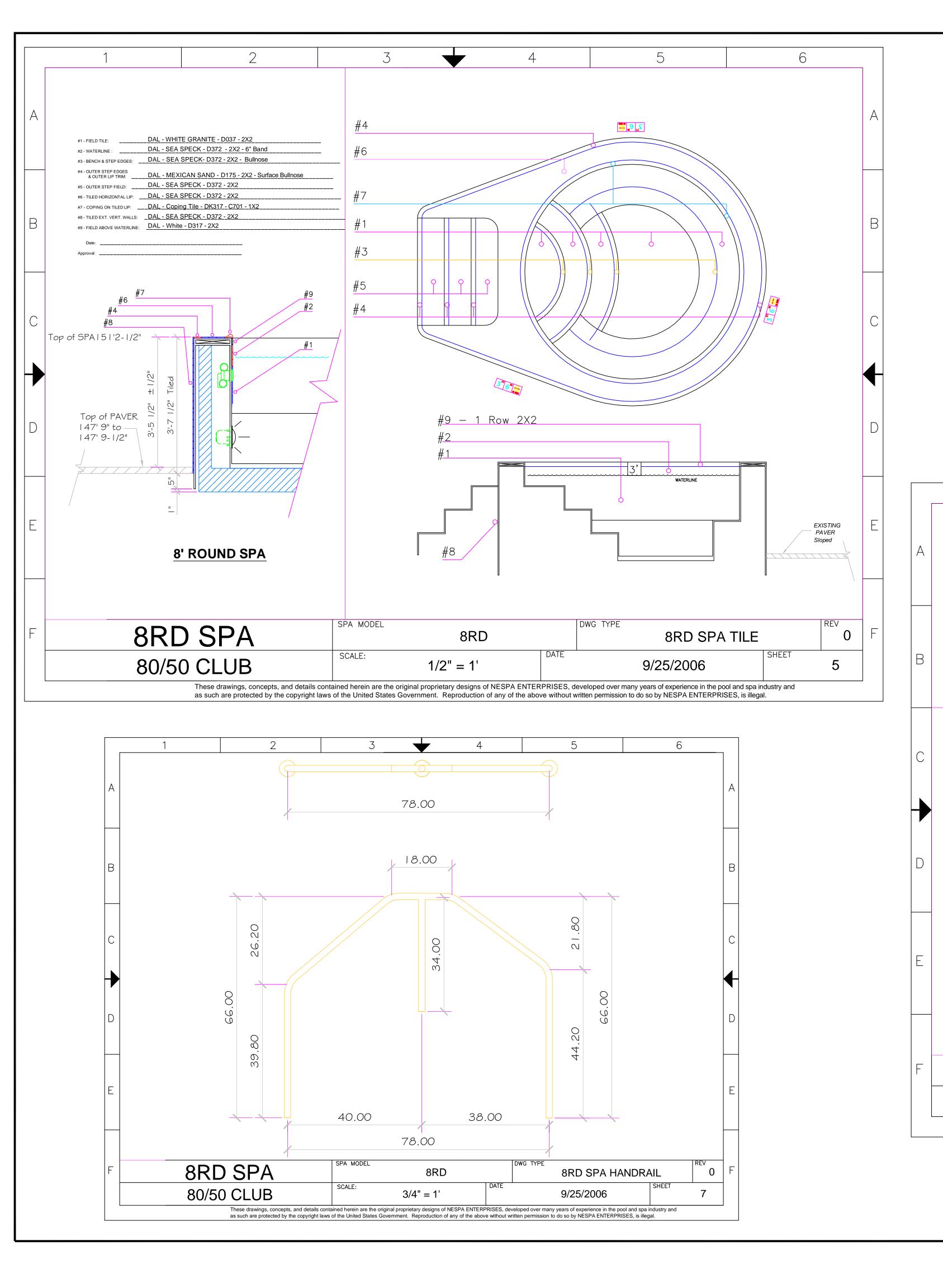


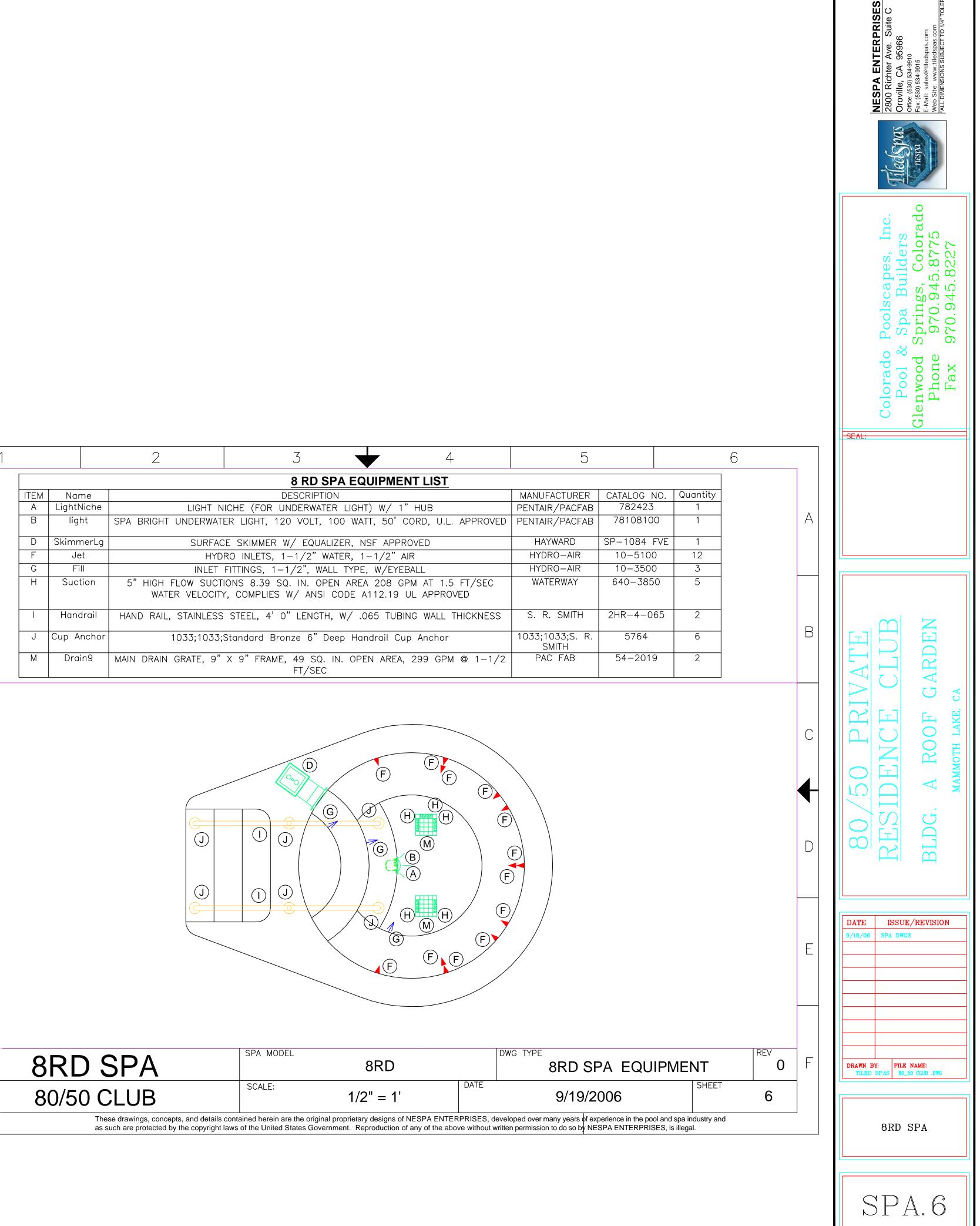


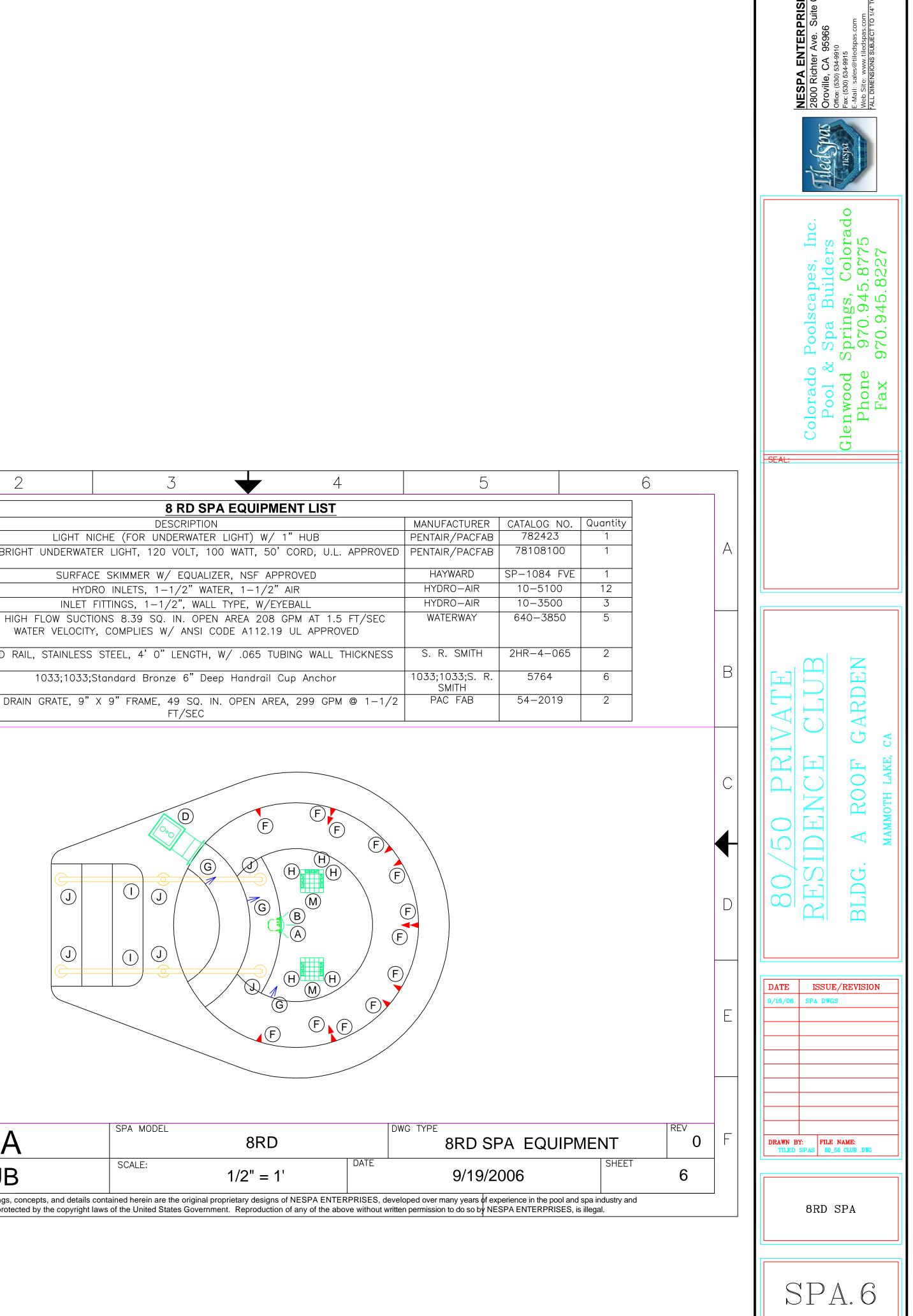
						Poolscapes, Inc. k Spa Builders Springs, Colorado 970.945.8775 970.945.827	
4 <u><b>MENT LIST</b></u>	5 MANUFACTURER	CATALOG NO.	G Quantity			Colorado Po Pool & Sj Glenwood Spi Phone 9 Fax 97	
1" HUB CORD, U.L. APPROVED PROVED AIR YEBALL M AT 1.5 FT/SEC WATER L APPROVED JBING WALL THICKNESS Anchor REA, 401 GPM @ 1-1/2	PENTAIR/PACFAB PENTAIR/PACFAB HAYWARD HYDRO-AIR HYDRO-AIR WATERWAY S. R. SMITH S. R. SMITH	782423 78108100 SP-1084 FVE 10-5100 10-3500 640-3850 2HR-4-065 5764 54-2020	3   2   2   24   6   9   2   6   3		B	RIVATE E CLUB F GARDEN	
	G E				C	DATE ISSNE/KEARING	
	TYPE			REV	E	9/18/06 SPA DWGS	
DATE DATE NESPA ENTERPRISES, developed any of the above without written per	9/22/200	ence in the pool and sp	SHEET a industry and	6	F	east spa SPA.4	

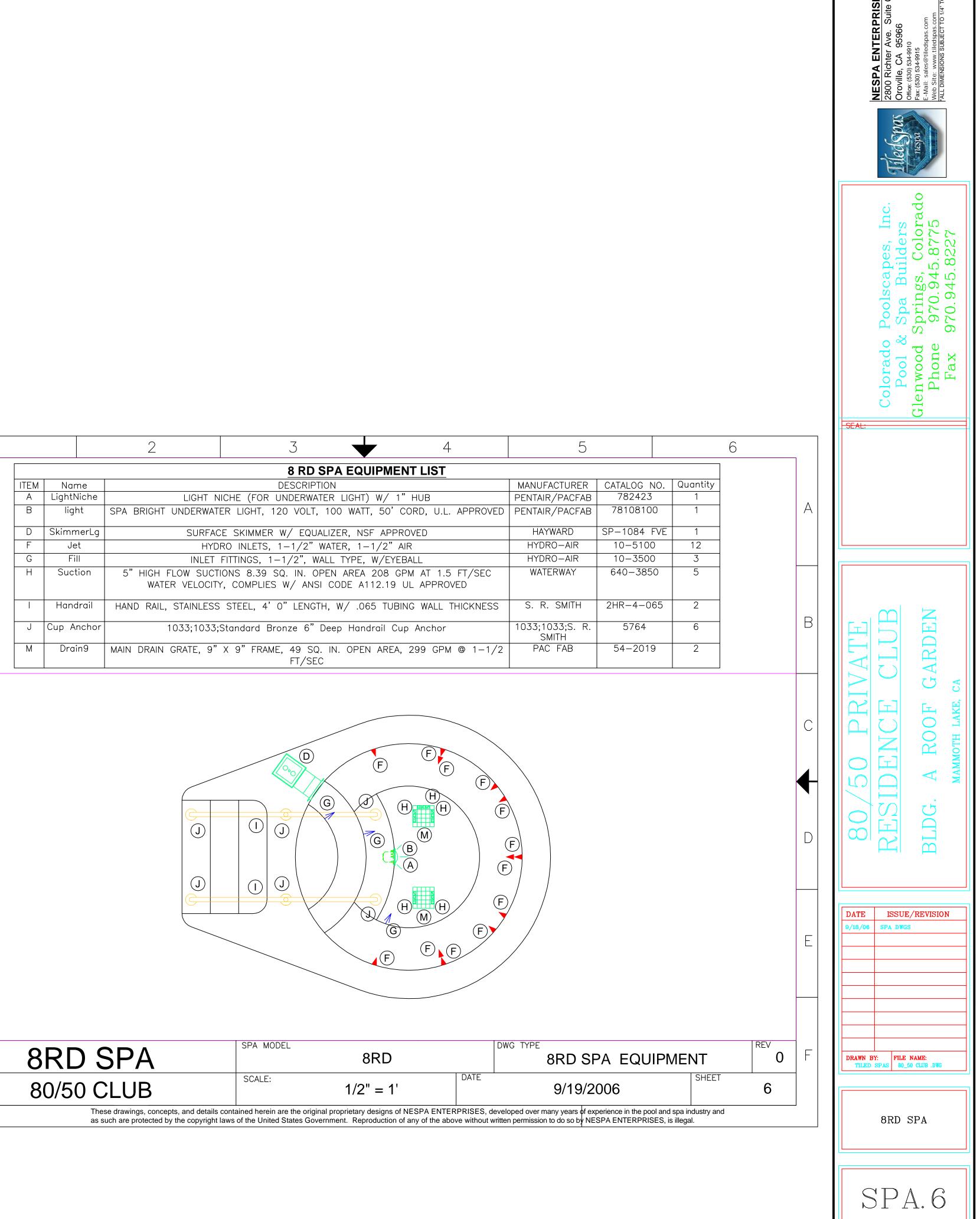


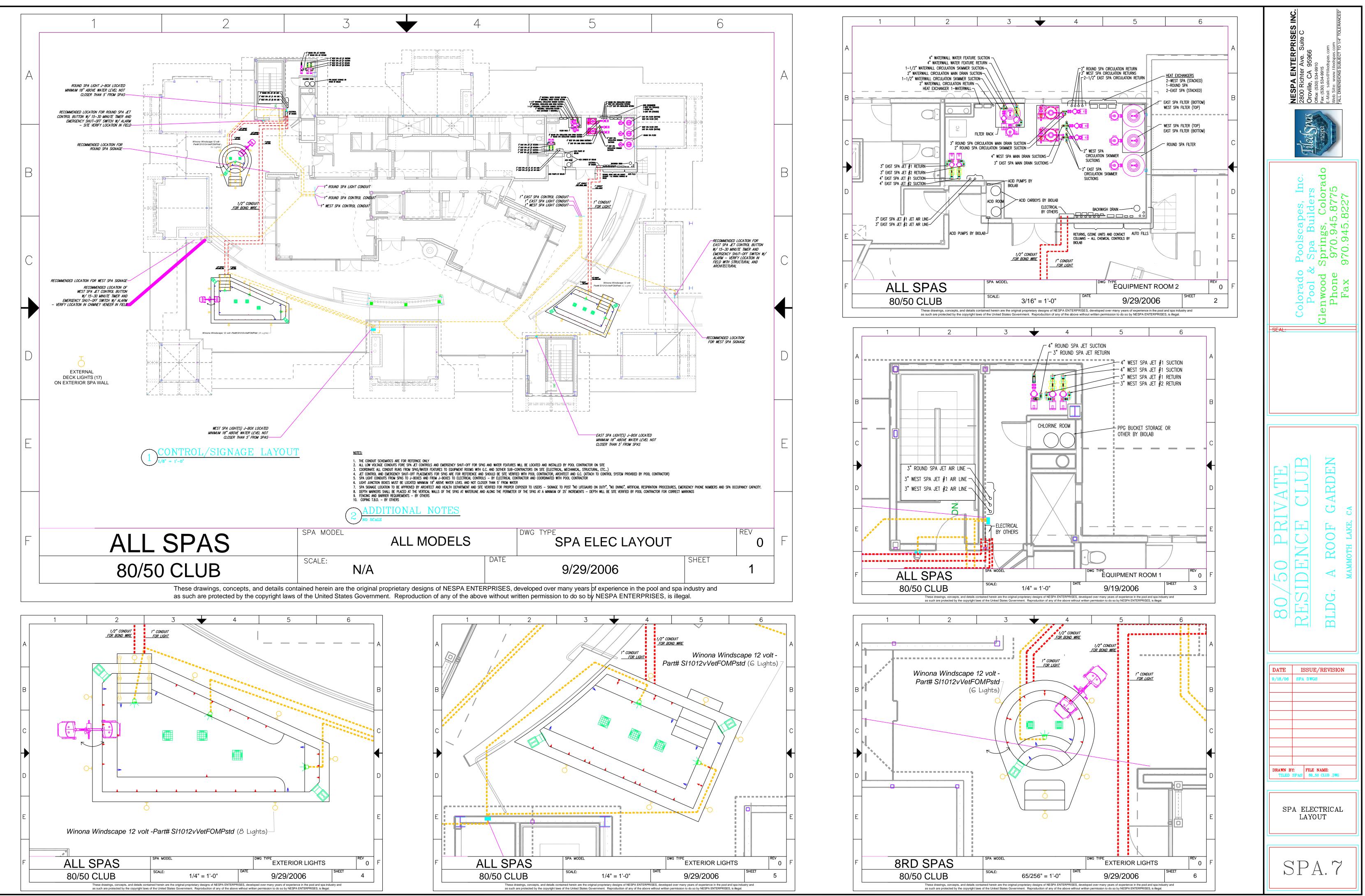






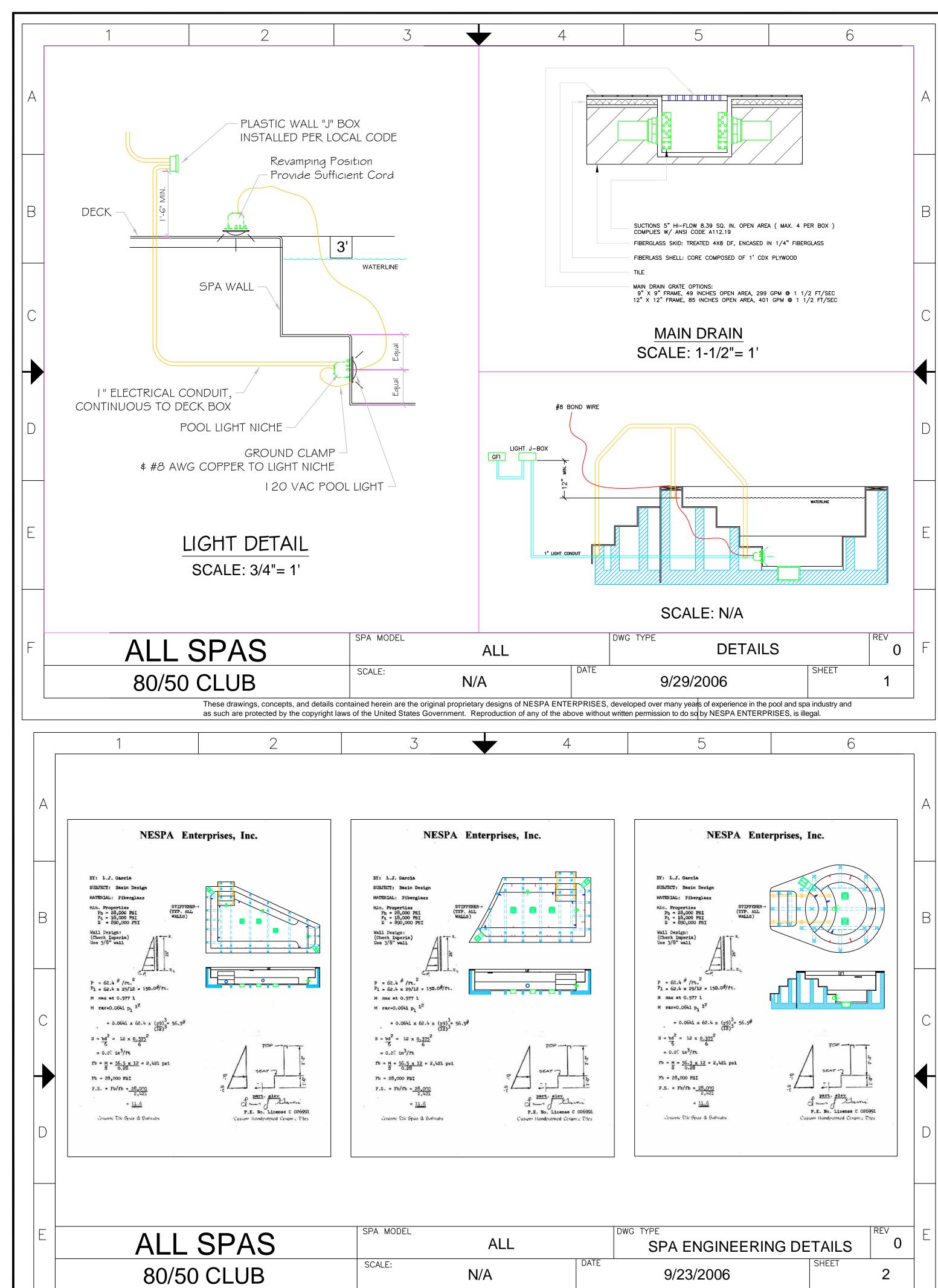








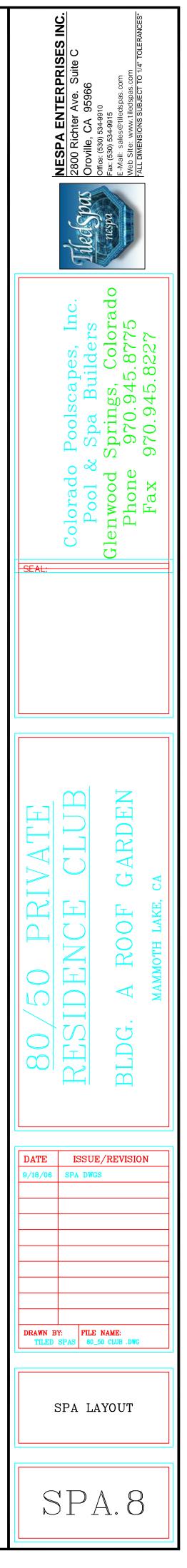
	**			
F	ALL SPAS	SPA MODEL		REV 0
	80/50 CLUB	SCALE: 1/4" = 1'-0"	9/29/2006	4
		ained herein are the original proprietary designs of NESPA ENTERPRISE of the United States Government. Reproduction of any of the above with	S, developed over many years of experience in the pool and spa industry and hout written permission to do so by NESPA ENTERPRISES, is illegal.	



# **POOL BONDING REQUIREMENTS:**

- 1. THE FOLLOWING PARTS SHALL BE BONDED TOGETHER AND CONNECTED TO THE COMMON BONDING GRID. A. ALL THE METALLIC PARTS OF THE POOL STRUCTURE INCLUDING COPYING STONES, DECK, PERMANENT PLAY STRUCTURES, PERMANENT EXERCISE STRUCTURES.
- B. ALL METAL FITTINGS WITHIN OR ATTACHED TO THE POOL STRUCTURE
- C. METAL PARTS ASSOCIATED WITH THE POOL WATER CIRCULATING SYSTEM, INCLUDING PUMPS, FILTERS, AND HEATERS.
- D. METAL PARTS ASSOCIATED WITH POOL COVERS E. METAL SHEATHED CABLES AND RACEWAYS, METAL PIPING AND ALL FIXED METAL PARTS WITHIN 5 FEET HORIZONTALLY OF INSIDE WALLS OF POOL AND WITHIN 12 FEET ABOVE MAXIMUM WATER LEVEL OF POOL.
- F. METAL PARTS ASSOCIATED WITH OBSERVATION STANDS, TOWERS, PLATFORMS, AND DIVING STRUCTURES.
- 2. BONDING CONDUCTORS SHALL BE MINIMUM #8 SOLID COPPER, INSULATED E.C. SHALL COORDINATE APPROVED CONNECTOR TYPE AND METHOD WITH LOCAL ELECTRICAL AND/ OR POOL INSPECTOR.
- 3. SPECIFIC MANUFACTURER'S INSTRUCTIONS REGARDING BONDING OR GROUNDING OF POOL EQUIPMENT, WHETHER INDICATED HEREIN OR NOT, SHALL BE STRICTLY FOLLOWED.
- 4. THE COMMON BONDING GRID SHALL NOT BE CONNECTED TO ANY ELECTRICAL DISTRIBUTION EQUIPMENT.
- 5. ANY PARTS IN ADDITION TO THOSE DESCRIBED HEREIN THAT ARE INDICATED BY POOL CONTRACTOR OR LOCAL INSPECTION AUTORITY SHALL BE BONDED TO THE COMMON BONDING GRID WITH NO ADDITIONAL COSTS INCURRED BY THE OWNER.
- 6. THE ELECTRICAL CONTRACTOR SHALL COORDINATE BONDING WITH GENERAL CONTRACTOR.

QTY.	EQUIPMENT NAME	VOLT	PHASE	HP/W	AMPS EA.	CIRCUIT EA.	LOCATION	CONTROLS OR INTERLOCKING
1	EAST SPA PUMP	208	1	3 HP	11 A	15 A	EQUIPMENT ROOM	STARTER, INTERLOCKED W/ GAS HEATER
2	EAST SPA JET PUMP	208	1	3 HP	11 A	15 A	EQUIPMENT ROOM	CONTROLS NEAR SPA
1	EAST SPA CONTROL SYSTEM	115/ 230	1	-	< 5 A	10 A	EQUIPMENT ROOM SPA SIDE CONTROLS @ SPA	SPA CONTROL CONDUIT BY PC JET CONTROL AND EMERGENCY SHUT-OF
2	EAST SPA HEAT EXCHANGER 400 MBH	-	-	-	-	-	EQUIPMENT ROOM	INTERLOCKED W/ CIRC. PUMPS CONTROLS BY MC
2	EAST SPA UNDERWATER LIGHTS	115	1	100 W	_	15 A GFI	SPA	CONDUIT, TO J-BOX , TO CONTROLS & BONDING BY EC
2	WEST SPA PUMP	208	1	1.5 HP	6.4 A	10 A	EQUIPMENT ROOM	STARTER, INTERLOCKED W/ GAS HEATER
2	WEST SPA JET PUMP	208	1	3 HP	11 A	15 A	EQUIPMENT ROOM	CONTROLS NEAR SPA
1	WEST SPA CONTROL SYSTEM	115/ 230	1	-	< 5 A	10 A	EQUIPMENT ROOM SPA SIDE CONTROLS @ SPA	SPA CONTROL CONDUIT BY PC JET CONTROL AND EMERGENCY SHUT-OF
2	WEST SPA HEAT EXCHANGER 400 MBH	-	-	-	-	-	EQUIPMENT ROOM	INTERLOCKED W/ CIRC. PUMPS CONTROLS BY MC
3	WEST SPA UNDERWATER LIGHTS	115	1	100 W	_	15 A GFI	SPA	
1	ROUND SPA PUMP	208	1	1.5 HP	6.4 A	10 A	EQUIPMENT ROOM	STARTER, INTERLOCKED W/ GAS HEATER
1	ROUND SPA JET PUMP	208	1	3 HP	11 A	15 A	EQUIPMENT ROOM	CONTROLS NEAR SPA
1	ROUND SPA CONTROL SYSTEM	115/ 230	1	_	< 5 A	10 A	EQUIPMENT ROOM	SPA CONTROL CONDUIT BY PC IN–HOUSE MASTER LOCATION T.B.D.
1	ROUND SPA HEAT EXCHANGER 400 MBH	-	-	_	-	-	EQUIPMENT ROOM	INTERLOCKED W/ CIRC. PUMPS CONTROLS BY MC
1	ROUND SPA UNDERWATER LIGHTS	115	1	100 W	-	15 A GFI	SPA	CONDUIT, TO J-BOX , TO CONTROLS & BONDING BY EC
4	OZONE PURIFICATION SYSTEM	115	1	-	< 10 A	15 A GFI	EQUIPMENT ROOM	OUTLET PROVIDED BY EC
4	POOL WATER LEVEL CONTROL	115	1	-	< 5 A	10 A	EQUIPMENT ROOM	CONDUIT TO SURGE TANK BY PC OUTLET PROVIDED BY EC
4	CHEMTROL PC5000 OR EQULA BY BIOLAB	115	1	_	< 5 A	10 A	EQUIPMENT ROOM	CONTROLS FEED PUMPS W/ SENSORS
4	STENNER 45M OR EQULA BY BIOLAB	115	1	-	< 5 A	10 A	EQUIPMENT ROOM	INTERLOCK WITH CHEM CONTROLS
4	PPG SYSTEM OR EQULA BY BIOLAB	115	1	1/2 HP	6.7 A	15 A	EQUIPMENT ROOM	INTERLOCK WITH CHEM CONTROLS
1	ADDITIONAL CIRCUIT FOR UPGRADES	230	1	-	-	40 A	EQUIPMENT ROOM	CONDUIT TO SURGE TANK BY PC OUTLET PROVIDED BY EC
3	HANDICAP LIFT F–006PSLB AQUA CREEK	24V	-	-	-	-	SPA SIDE	OUTLET PROVIDED BY EC FOR RE-CHARGING BATTERY
	ALL SPA	S		SPA MODE	L	ALL	DWG TYPE	ELECTRICAL



# **SPA CONSTRUCTION NOTES:**

#### **OCCUPANCY:**

BATHERS WOMEN'S WHIRLPOOL = 13 BATHERS BATHERS WOMEN'S PLUNGE = 3 BATHERS BATHERS MEN'S WHIRLPOOL = 6 BATHERS BATHERS MEN'S PLUNGE = 3 BATHERS

## PLUMBING:

1. ALL FRESH WATER AND WASTE WATER CONNECTIONS AND PIPING SHALL BE

- INSTALLED BY A LICENSED PLUMBER. 2. HOSE BIB(S), WITH VACUUM BREAKERS REQUIRED, SHALL BE A MAXIMUM
- SEPARATION DISTANCE OF 150 FEET, FOR CLEANING OF ALL PARTS OF THE POOL
- AND DECK. LOCATION AND INSTALLATION BY PLUMBING CONTRACTOR. 3. EXPOSED PIPING: ALL PIPING IN OR AROUND POOLS TO BE SCHEDULE 40 PVC. ALL PIPING IN FILTER ROOM
- TO BE SCHEDULE 40 UNLESS OTHERWISE INDICATED. 4. CONCEALED PIPING: NSF APPROVED SCHEDULE 40 PVC, AND BURIED.
- 5. VALVES AND FITTINGS: NSF APPROVED PVC OR AS OTHERWISE INDICATED AS RECOMMENDED TO WORK WITH PIPING AS LISTED ABOVE.

## **ELECTRICAL NOTES:**

- 1. ALL ELECTRICAL WORK SHALL BE PERFORMED BY A LICENSED ELECTRICIAN.
- 2. ALL WIRING TO CONFORM TO THE NATIONAL ELECTRICAL CODE (1999 EDITION) AND STATE ELECTRICAL CODES.
- 3. THE POOL SHALL BE GROUNDED AND LIGHTS, IF ANY INSTALLED ACCORDING TO MANUFACTURERS PRINTED INSTRUCTIONS.
- 4. LIGHTING OF AT LEAST 36 LUMENS/S.F. OF POOL SURFACE AREA AND DECK AREA REQUIRED FOR POOL AREA USE. LIGHTING LOCATION AND INSTALLATION PROVIDED BY ELECTRICAL CONTRACTOR.
- 5. GFI RECEPTACLES SHALL BE LOCATED AROUND THE POOL(S) PERIMETER TO PROVIDE ADEQUATE ACCESS FOR POOL
- CLEANING EQUIPMENT.
- 6. ALL WIRING AND GROUNDING TO CONFORM TO THE NEC 680 BUILDING CODE (CURRENT EDITION) AND STATE ELECTRICAL CODES. 7. EQUIPMENT ROOM SHALL BE LIGHTED TO PROVIDE 30 FOOT CANDLE ILLUMINATION AT FLOOR.
- 8. PUMP ON/OFF DISCONNECT SWITCHES FOR EACH PUMP. FOLLOW Penn. STATE ELECTRICAL CODES

#### **POOL BONDING REQUIREMENTS:**

1. THE FOLLOWING PARTS SHALL BE BONDED TOGETHER AND CONNECTED TO THE COMMON BONDING GRID

- A. ALL THE METALLIC PARTS OF THE POOL STRUCTURE INCLUDING COPYING STONES, DECK, PERMANENT PLAY STRUCTURES, PERMANENT EXERCISE STRUCTURES
- B. ALL METAL FITTINGS WITHIN OR ATTACHED TO THE POOL STRUCTURE
- C. METAL PARTS ASSOCIATED WITH THE POOL WATER CIRCULATING SYSTEM, INCLUDING PUMPS, FILTERS, AND HEATERS.
- D. METAL PARTS ASSOCIATED WITH POOL COVERS E. METAL SHEATHED CABLES AND RACEWAYS, METAL PIPING AND ALL FIXED METAL PARTS WITHIN 5 FEET HORIZONTALLY OF INSIDE
- WALLS OF POOL AND WITHIN 12 FEET ABOVE MAXIMUM WATER LEVEL OF POOL.
- F. METAL PARTS ASSOCIATED WITH OBSERVATION STANDS, TOWERS, PLATFORMS, AND DIVING STRUCTURES.
- 2. BONDING CONDUCTORS SHALL BE MINIMUM #8 SOLID COPPER, INSULATED E.C. SHALL COORDINATE APPROVED CONNECTOR TYPE AND METHOD WITH LOCAL ELECTRICAL AND/ OR POOL INSPECTOR. 3. SPECIFIC MANUFACTURER'S INSTRUCTIONS REGARDING BONDING OR GROUNDING OF POOL EQUIPMENT, WHETHER INDICATED HEREIN
- OR NOT, SHALL BE STRICTLY FOLLOWED.
- 4. THE COMMON BONDING GRID SHALL NOT BE CONNECTED TO ANY ELECTRICAL DISTRIBUTION EQUIPMENT
- 5. ANY PARTS IN ADDITION TO THOSE DESCRIBED HEREIN THAT ARE INDICATED BY POOL CONTRACTOR OR LOCAL INSPECTION AUTORITY SHALL BE BONDED TO THE COMMON BONDING GRID WITH NO ADDITIONAL COSTS INCURRED BY THE OWNER.
- 6. THE ELECTRICAL CONTRACTOR SHALL COORDINATE BONDING WITH GENERAL CONTRACTOR.

#### **PIPING NOTES:**

- 1. ALL PIPING SHALL BE IN ACCORDANCE WITH THE STATE AND COUNTY DEPARTMENT OF PUBLIC HEALTH REGULATIONS. 2. ALL PIPING DESIGNED FOR 6' PER SECOND MAXIMUM SUCTION. 10' PER SECOND MAXIMUM PRESSURE AND 3' PER SECOND
- MAXIMUM GRAVITY 3. MAIN DRAIN PIPING SHALL NOT EXCEED A RECIRCULATION RATE OF 6' PER SECOND.
- 4. ALL DRAWINGS ARE INTENDED FOR SCHEMATIC USE ONLY!! FINAL LOCATIONS SHALL BE FIELD VERIFIED WITH ALL OTHER TRADES BY CONTRACTOR.
- 5. CONTRACTOR SHALL COORDINATE ALL WORK WITH ARCHITECTURAL, MECHANICAL, ELECTRICAL AND STRUCTURAL DRAWINGS.
- 6. ALL PVC PLUMBING MUST BE NSF LISTED FOR POTABLE WATER AND MEET ASTM B 1785 STANDARDS. 7. A FLOWMETER SHALL BE PROVIDED IN THE RECIRCULATION PUMP DISCHARGE LINE. INSTALL ON A STRAIGHT LENGTH OF PIPE AT A
- DISTANCE OF AT LEAST 10 PIPE DIAMETERS DOWNSTREAM AND 5 PIPE DIAMETERS UPSTREAM FROM ANY VALVE, ELBOW OR OTHER SOURCE OF TURBULENCE.

#### DEPTH MARKERS

- A. DEPTH MARKERS SHALL BE 6" X 6" INLAYED TILES AT WATERLINE AND ON POOL DECK. THE WALL IN A MAXIMUM
- 25 FOOT INTERVALS. "NO DIVING" ON DECK AS REQUIRED.
- B. POOL DEPTH MARKERS ON THE FACE OF THE WALL SHALL BE LOCATED AT OR ABOVE THE WATER SURFACE OF THE SWIMMING POOL ENCLOSURE IN PLAIN VIEW TO BATHER.
- C. DEPTH MARKERS SHALL BE OF COLOR CONTRASTING WITH BACKGROUND.

## **SPA USE SIGN / SAFETY SIGN**

(SAFETY SIGN SHALL INCLUDE BUT NOT LIMITED TO THE FOLLOWING MESSAGE)

- 1. RISK OF FETUS INJURY-HOT WATER EXPOSURE LIMITATIONS VARY FROM PERSON TO PERSON. PREGNANT WOMEN AND SMALL CHILDREN SHOULD NOT USE SPA PRIOR TO MEDICAL CONSULTATION.
- 2. RISK OF DROWNING- PERSONS SUFFERING FROM HEART DISEASE, HIGH OR LOW BLOOD PRESSURE AND OTHER HEALTH PROBLEMS SHOULD NOT ENTER SPA WITHOUT PRIOR MEDICAL CONSULTATION AND PERMISSION FROM THEIR DOCTOR.
- 3. RISK OF DROWNING DO NOT USE THE SPA WHILE UNDER THE INFLUENCE OF ALCOHOL, NARCARCOTICS, OR OTHER
- DRUGS THAT CAUSE SLEEPINESS, DROWSINESS OR RAISE/LOWER BLOOD PRESSURE. 4. RISK OF CHILD DROWNING- UNSUPERVISED USE OF THE SPA BY CHILDREN IS PROHIBITED.
- 5. RISK OF INJURY BEFORE ENTERING, CHECK SPA WATER TEMPERATURE. DO NOT USE THE SPA IF THE TEMPERATURE IS ABOVE 104° F (40°C).
- 6. RISK OF DROWNING-USE CAUTION WHEN BATHING ALONE. OVEREXPOSURE TO HOTWATER MAY CAUSE NAUSEA, DIZZINESS AND FAINTING. LOWER WATER TEMPERATURES ARE RECOMMENDED FOR EXTENDED USE
- (EXCEEDING 10-15 MIN.) AND FOR YOUNG CHILDREN.
- 7. RISK OF INJURY ENTER AND EXIT SLOWLY. 8. RISK OF INJURY - KEEP ALL BREAKABLE OBJECTS OUT OF SPA AREA.
- 9. RISK OF SHOCK NEVER PLACE ELECTRICAL APPLIANCES (PHONE, RADIO, TV, ETC.) WITHIN FIVE FEET (5'-0") OF THE SPA. 10. RISK OF SHOCK - THE SPA SHALL NOT BE OPERATED DURING SERVERE WEATHER CONDITIONS, I.E. ELECTRICAL
- STORMS, TORNADOES, ETC. 11. SECURE THE FACILITY AGAINST UNAUTHORIZED ACCESS.
- 12. RISK OF DROWNING DO NOT ALLOW THE USE OF OR OPERATE SPA IF THE SUCTION OUTLET COVER IS MISSING, DAMAGED OR LOOSE

#### SAFETY SIGNAGE

- 1. FILTER ROOM DOOR TO HAVE A SIGN LOCATED ON THE OUTSIDE SAYING "CAUTION CHLORINE HAZARD AREA! UNAUTHORIZED PERSONS KEEP OUT. CHLORINE CAUSES BURNS. SEVERE EYE HAZARD. & OTHER INJURIES WHICH MAY BE FATAL IF INHALED.'
- 2. POOL RULES SIGNS LISTING RULES DETERMINED BY OWNER LOCATED IN EACH CHANGING ROOM AREA 3. MAIN POOL ALL AREAS THAT ARE 5'-0" DEEP OR LESS SHALL HAVE NO DIVING SYMBOL OR LETTERS AND THE WATER DEPTH, (4" NUMBERS/LETTERS) MARKINGS TO OCCUR AT A MIN. OF EVERY 25' BETWEEN AND WHERE EVERY DEPTH
- CHANGE OCCURS PER CODE & IN COMPLIANCE W/ CODE. DEPTH MARKINGS TO BE PAINTED WITH IN 18" OF WATERS EDGE. FINISH SHOULD BE NON- SKID PAINT.

# SIGNAGE, EMERGENCY SHUTOFF, ETC. TO BE COMPLETED PER ALL APPLICABLE CODE REQUIREMENTS INCLUDING, BUT NOT LIMITED TO, CBC, ADA, & MONO COUNTY HEALTH DEPARTMENT.

ALL CODE REFERENCES ARE BASED ON THE 2005 NEC. THE GROUNDING AND BONDING REQUIREMENTS IN THIS COLUMN APPLY TO SOLIDLY GROUNDED SYSTEMS THAT OPERATE AT NOT MORE THAN 600V, INCLUDING 120/240V, 120/208V, AND 277/480V.WHAT COMES TO MIND WHEN YOU THINK OF POOLS, SPAS, HOT TUBS, AND SIMILAR INSTALLATIONS? MOST PEOPLE WOULD SAY FUN AND RELAXATION. BUT THE PERSON TRYING TO PROPERLY GROUND AND BOND THESE INSTALLATIONS IS MORE LIKELY TO SAY CONFUSION AND FRUSTRATION. WHY? BECAUSE OF A PHRASE KNOWN AS EQUIPOTENTIAL BONDING, WHICH IS A TERM SOME INSTALLERS AREN'T FAMILIAR WITH. TO HELP US CLEAR UP THE CONFUSION, LET'S RECAP THREE BASIC CONCEPTS

1. WHEN YOU GROUND, YOU CONNECT SOMETHING TO THE EARTH. THINK OF THIS AS EARTHING.

2. WHEN YOU BOND, YOU CREATE A CONDUCTIVE PATH BETWEEN METALLIC OBJECTS

3. BONDING IS THE METHOD BY WHICH YOU CREATE A LOW-IMPEDANCE PATH FOR FAULT CURRENT TO FLOW. THE PURPOSE OF EQUIPOTENTIAL BONDING IS TO BRING METALLIC OBJECTS TO THE SAME POTENTIAL, THUS REDUCING THE SHOCK HAZARD. THIS IS OBVIOUSLY AN IMPORTANT CONSIDERATION FOR PEOPLE IMMERSED IN A CONTAINER OF WATER.

THE INTENTION OF EQUIPOTENTIAL BONDING IS TO REDUCE EARTH VOLTAGE GRADIENTS IN THE AREA AROUND A PERMANENTLY INSTALLED POOL OR SIMILAR INSTALLATION BY THE USE OF A COMMON BONDING GRID PER 680.26(B) AND (C) . EQUIPOTENTIAL BONDING IS NOT INTENDED TO PROVIDE A LOW-IMPEDANCE GROUND-FAULT CURRENT PATH TO THE SOURCE (WHICH WOULD ASSIST IN CLEARING A GROUND FAULT) AS REQUIRED BY 250.4(A)(3). IT ALSO HAS NOTHING TO DO WITH CREATING A PATH FOR FAULT CURRENT. THEREFORE, THE 8 AWG OR LARGER SOLID COPPER EQUIPOTENTIAL BONDING CONDUCTOR REQUIRED BY 680.26(C) ISN'T REQUIRED TO EXTEND TO (OR ATTACH TO) ANY PANELBOARD, SERVICE EQUIPMENT, OR ELECTRODE.

IN ADDITION TO EQUIPOTENTIAL BONDING, THE CODE REQUIRES ANY WIRING METHOD USED FOR EQUIPMENT ASSOCIATED WITH A POOL, SPA, OR HOT TUB TO INCLUDE AN INSULATED COPPER EQUIPMENT GROUNDING (BONDING) CONDUCTOR. YOU MUST SIZE THIS CONDUCTOR PER 250.122, BUT IT CAN'T BE SMALLER THAN 12 AWG COPPER. VARIOUS OTHER REQUIREMENTS APPLY, DEPENDING ON THE TYPE OF RACEWAY YOU USE. THESE REQUIREMENTS ALL WORK TOWARD PROVIDING AN EFFECTIVE GROUND-FAULT CURRENT PATH.

POOL LIGHTS. WHEN WIRING LUMINAIRES IN A POOL, THE GOAL IS TO LIGHT UP THE POOL, NOT ITS OCCUPANTS. THIS IS WHY BRANCH-CIRCUIT CONDUCTORS FOR AN UNDERWATER LUMINAIRE MUST CONTAIN AN INSULATED COPPER EQUIPMENT GROUNDING (BONDING) CONDUCTOR SIZED PER TABLE 250.122. IN NO CASE CAN THIS CONDUCTOR BE SMALLER THAN 12 AWG (FIG. 1). YOU MUST NOT SPLICE THE EQUIPMENT GROUNDING (BONDING) CONDUCTOR FOR THE UNDERWATER LUMINAIRE [680.23(F)(2)], UNLESS ONE OF TWO CONDITIONS EXISTS (FIG. 2 ON PAGE 46): 1. MORE THAN ONE UNDERWATER LUMINAIRE IS SUPPLIED BY THE SAME BRANCH CIRCUIT. IF SO, THE EQUIPMENT

- GROUNDING (BONDING) CONDUCTOR CAN TERMINATE AT A LISTED POOL
- JUNCTION BOX THAT MEETS THE REQUIREMENTS OF 680.24(A).

2. THE EQUIPMENT GROUNDING (BONDING) CONDUCTOR TERMINATES AT THE GROUNDING TERMINAL OF A LISTED POOL TRANSFORMER, GFCI, CLOCK SWITCH, OR MANUAL SNAP SWITCH THAT IS

LOCATED BETWEEN THE PANELBOARD AND A JUNCTION BOX CONNECTED TO THE CONDUIT THAT EXTENDS DIRECTLY TO THE UNDERWATER LUMINAIRE.

THE BRANCH-CIRCUIT CONDUCTORS FOR THE UNDERWATER LUMINAIRE MUST NOT OCCUPY RACEWAYS, BOXES, OR ENCLOSURES CONTAINING OTHER CONDUCTORS ON THE LOAD SIDE OF A GFCI OR TRANSFORMER - UNLESS ONE OF THE FOLLOWING CONDITIONS EXISTS: 1. THE OTHER CONDUCTORS ARE GFCI PROTECTED

- 2. THE OTHER CONDUCTORS ARE GROUNDING (BONDING) CONDUCTORS.
- 3. THE OTHER CONDUCTORS SUPPLY A FEED-THROUGH TYPE GFCI.

4. THE OTHER CONDUCTORS ARE IN A PANELBOARD.JUNCTION BOXES. THE JUNCTION BOX (DECK BOX) THAT CONNECTS DIRECTLY TO AN UNDERWATER PERMANENTLY INSTALLED POOL, OUTDOOR SPA, OR OUTDOOR HOT TUB LUMINAIRE FORMING SHELL MUST BE LISTED AS A SWIMMING POOL JUNCTION BOX AND EQUIPPED WITH THREADED ENTRIES OR A NONMETALLIC HUB [680.24]. IT ALSO MUST BE CONSTRUCTED OF COPPER, BRASS, OR CORROSION-RESISTANT MATERIAL APPROVED BY THE AUTHORITY HAVING JURISDICTION (AHJ). YOU MUST PROVIDE ELECTRICAL CONTINUITY BETWEEN ALL METAL CONDUIT AND THE GROUNDING (BONDING) TERMINALS WITHIN THE JUNCTION BOX.

YOU ALSO MUST ENSURE THE JUNCTION BOX HAS AT LEAST ONE MORE GROUNDING (BONDING) TERMINAL THAN THE NUMBER OF CONDUIT ENTRIES [680.24(D)]. TYPICALLY, THERE ARE FOUR GROUNDING (BONDING) TERMINALS IN THE JUNCTION BOX AND THREE CONDUIT ENTRIES. FINALLY, YOU MUST PROVIDE A STRAIN RELIEF AT THE ENCLOSURE WHERE YOU TERMINATE THE FLEXIBLE CORD OF AN UNDERWATER LUMINAIRE [680.24(E)].

BONDING METAL PARTS TO THE EQUIPOTENTIAL BONDING GRID. ENSURE THE FOLLOWING FIVE PARTS OF A PERMANENTLY INSTALLED POOL OUTDOOR SPA, OR OUTDOOR HOT TUB ARE BONDED TOGETHER AND TO THE EQUIPOTENTIAL BONDING GRID.

- 1. ALL METALLIC PARTS OF REINFORCING METAL NOT ENCAPSULATED WITH A NONCONDUCTIVE COMPOUND. THE USUAL STEEL TIE-WIRES THAT SECURE REBAR TOGETHER ARE CONSIDERED SUITABLE FOR BONDING THE REINFORCING STEEL TOGETHER (FIG. 3 ON PAGE 46). WHERE CONDUCTIVE REINFORCING STEEL OF THE PERMANENTLY INSTALLED POOL, OUTDOOR SPA, OR OUTDOOR HOT TUB SHELL AND DECK IS NOT AVAILABLE, YOU MUST PROVIDE AN ALTERNATIVE MEANS IN ACCORDANCE WITH 680.26(C) TO ELIMINATE VOLTAGE GRADIENTS THAT WOULD OTHERWISE BE PROVIDED BY UNENCAPSULATED, BONDED REINFORCING STEEL.
- 2. ALL METAL FORMING SHELLS FOR UNDERWATER WET-NICHE LUMINAIRES.
- 3. METAL FITTINGS WITHIN OR ATTACHED TO THE PERMANENTLY INSTALLED POOL, OUTDOOR SPA, OR OUTDOOR HOT TUB STRUCTURE, SUCH AS LADDERS AND HANDRAILS.
- 4. METAL PARTS OF ELECTRICAL EQUIPMENT ASSOCIATED WITH THE CIRCULATING SYSTEM (WATER HEATERS AND
- PUMP MOTORS) AND METAL PARTS OF EQUIPMENT ASSOCIATED WITH POOL COVERS. 5. METAL CABLES, METAL RACEWAYS, METAL PIPING, AND ALL FIXED METAL PARTS OF ELECTRICAL EQUIPMENT —
- EXCEPT THOSE SEPARATED FROM THE POOL BY A PERMANENT BARRIER LOCATED WITHIN:

5 FEET HORIZONTALLY OF THE INSIDE WALLS OF THE PERMANENTLY INSTALLED POOL, OUTDOOR SPA, OR OUTDOOR HOT TUB. 12 FEET ABOVE THE MAXIMUM WATER LEVEL OF THE PERMANENTLY INSTALLED POOL, OUTDOOR SPA, OR OUTDOOR HOT TUB; OR ANY OBSERVATION STANDS, TOWERS, PLATFORMS, OR DIVING STRUCTURES.

THE EQUIPOTENTIAL BONDING GRID. ALL METAL PARTS SPECIFIED IN 680.26(B) MUST BE BONDED TO AN EQUIPOTENTIAL BONDING GRID WITH A SOLID COPPER CONDUCTOR NOT SMALLER THAN 8 AWG. THE TERMINATION OF THE BONDING CONDUCTOR MUST BE MADE BY EXOTHERMIC WELDING, LISTED PRESSURE CONNECTORS, OR LISTED CLAMPS THAT ARE LABELED AS SUITABLE FOR THE PURPOSE. AN EQUIPOTENTIAL BONDING GRID MUST EXTEND UNDER PAVED WALKING SURFACES FOR 3 FEET HORIZONTALLY FROM THE WATER [680.26(C)].

- THE EQUIPOTENTIAL BONDING GRID MUST BE FORMED FROM EITHER OR BOTH OF:
- 1. THE STRUCTURAL REINFORCING STEEL OF A CONCRETE PERMANENTLY INSTALLED POOL, OUTDOOR SPA, OR OUTDOOR
- HOT TUB, TIED TOGETHER BY THE USUAL STEEL TIE WIRES.
- 2. THE METAL WALLS OF A PERMANENTLY INSTALLED POOL, OUTDOOR SPA, OR OUTDOOR HOT TUB.

WHAT IF NEITHER OF THESE IS AVAILABLE? WHERE STRUCTURAL REINFORCING STEEL OR THE WALLS OF BOLTED OR WELDED METAL PERMANENTLY INSTALLED POOL, OUTDOOR SPA, OR OUTDOOR HOT TUB STRUCTURES ARE NOT AVAILABLE, YOU MUST CONSTRUCT AN EQUIPOTENTIAL BONDING GRID AS FOLLOWS:

- (A) THE EQUIPOTENTIAL GRID CAN BE CONSTRUCTED WITH 8 AWG BARE SOLID COPPER CONDUCTORS THAT ARE
- BONDED TO EACH OTHER AT ALL POINTS OF CROSSING BY EXOTHERMIC WELDING. LISTED PRESSURE CONNECTORS OF THE SET SCREW OR COMPRESSION TYPE, LISTED CLAMPS, OR OTHER
- LISTED FITTINGS [250.8].
- (B) THE EQUIPOTENTIAL BONDING GRID MUST COVER THE CONTOUR OF THE PERMANENTLY INSTALLED POOL, OUTDOOR SPA, OR OUTDOOR HOT TUB, AND DECK EXTENDING 3 FEET

HORIZONTALLY FROM THE WATER. THE EQUIPOTENTIAL BONDING GRID MUST BE ARRANGED IN A 1-FOOT BY 1-FOOT NETWORK OF 8 AWG CONDUCTORS, WITH A TOLERANCE OF 4 INCHES.

ALL EQUIPOTENTIAL BONDING TERMINATIONS MUST BE BY EXOTHERMIC WELDING, LISTED PRESSURE CONNECTORS OF THE SET SCREW OR COMPRESSION TYPE, LISTED CLAMPS, OR OTHER LISTED FITTINGS [250.8].

DISPELLING COMMON MYTHS. LET'S GO BACK FOR A MOMENT TO A FREQUENTLY MISAPPLIED TERM: GROUNDING. ONE OF THE MYTHS ABOUT GROUNDING (EARTHING) IS THAT IT REDUCES SHOCK HAZARDS BY BRINGING EVERYTHING TO GROUND POTENTIAL. BECAUSE THE EARTH IS NOT OF UNIFORM CONDUCTIVITY, THAT CAN HARDLY BE THE CASE. ANOTHER MYTH IS THAT GROUNDING (EARTHING) PROVIDES A COMMON REFERENCE POINT. THIS ALSO DEFIES LOGIC.

WHAT ABOUT THAT COMMON REFERENCE? IF GROUND (EARTH) IS NOT IT, WHAT IS? YOU CAN ESTABLISH A COMMON REFERENCE BY CONSTRUCTING A BONDING GRID. NOT AN EARTHING CONNECTION. CONNECT YOUR BONDING PATH TO THE GROUNDING GRID. AND ALL OF THE OBJECTS ARE AT AN EQUAL POTENTIAL.

WHEN YOU HAVE EQUAL POTENTIAL, THEN BY DEFINITION YOU DO NOT HAVE A VOLTAGE DIFFERENCE. WITHOUT A VOLTAGE DIFFERENCE, THERE CAN BE NO CURRENT FLOW. THUS, YOU USE AN EQUIPOTENTIAL BONDING SYSTEM — NOT A GROUNDING SYSTEM — TO REDUCE SHOCK HAZARDS.

