STRUCTURAL NOTES

CODES AND STANDARDS

1. ALL CONSTRUCTION SHALL CONFORM TO THE UNIFORM BUILDING CODE, 1988 EDITION.
2. AISC MANUAL OF STEEL CONSTRUCTION, 8TH EDITION, 1980.
3. ACI BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE (ACI 318-83).
4. ACI SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS (ACI 301-84).

GENERAL

1. ALL DIMENSIONS AND DETAILS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO FABRICATION AND/OR CONSTRUCTION. THIS INCLUDES, BUT IS NOT LIMITED TO, COORDINATING WITH THE ARCHITECTURAL ON THE SIZE AND LOCATION OF ALL DOORWAYS AND OTHER OPENINGS THROUGH CONCRETE, VERIFYING SIZE AND LOCATION OF ALL MECHANICAL AND ELECTRICAL OPENINGS WITH THE RESPECTIVE SUBCONTRACTOR, AS WELL AS COORDINATING ALL INSERTS AND ATTACHMENTS FOR THE USE OF OTHER TRADES.
2. ALL SHOP DRAWINGS FOR REINFORCING STEEL, STRUCTURAL STEEL, METAL DECK, MISCELLANEOUS STEEL, AND GLUE LAMINATED TIMBER SHALL BE SUBMITTED TO AND REVIEWED BY THE ENGINEER PRIOR TO FABRICATION.

STRUCTUTAL CONCEPT

1. GRAVITY LOADS ARE CARRIED BY WOOD JOISTS TO GLUE-LAMINATED RAFTERS SUPPORTED BY COLUMNS THAT DELIVER THEIR LOADS TO CONCRETE FOUNDATIONS. THE VERTICAL LOAD CARRYING FRAME IS COMPLETE.
2. LATERAL LOADS, WIND AND SEISMIC, ARE DISTRIBUTED BY PLYWOOD SHEATHED ROOF ACTING AS DIAPHRAGMS TO PLYWOOD SHEATHED EXTERIOR SHEAR WALLS THAT ARE ANCHORED TO A CONTINUOUS FOUNDATION.

DESIGN LOADS

1. LIVE LOADS

ROOF (SNOW)	= 25 PSF
GROUND FLOOR	= 100 PSF
MECHANICAL FLOOR	= ACTUAL EQUIP WTS

2. LIVE LOAD REDUCTION: UBC SEC 2306 FOR COLUMNS ONLY
3. WIND LOAD: UBC SEC 2311(e)2 METHOD 2

BASIC WIND SPEED	= 90 MPH

4. SEISMIC LOAD

$V = \frac{Z I C}{R_w} W$; WHERE:

Z (ZONE 3) = 0.3
I = 1.0
C = 2.75 ($M \angle .$)
R_w (MASONRY SHEAR WALL) = 8
$V = \frac{0.3 (1.0) (2.75)}{8} W = 0.1 W$

5. SOIL BEARINGS

SPREAD FOOTINGS	= 2500 PSF
CONTINUOUS FOOTINGS	= 2500 PSF

6. LATERAL SOIL PRESSURE

BASEMENT WALLS	= 45 PCF
RETAINING WALLS	= 35 PCF

FOUNDATION

1. FOUNDATION DESIGN IS BASED ON THE REPORT "SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATION, HAL MOE MEMORIAL SWIMMING POOL," DATED 5 DECEMBER 1988, BY RITTENHOUSE ZEEMAN ASSOCIATES, INC. THE CONTRACTOR SHALL THOROUGHLY FAMILIARIZE HIMSELF WITH THIS REPORT.
2. THE FOUNDATION SYSTEM IS COMPRISED OF SPREAD FOOTINGS BEARING IN THE UNDISTURBED, MEDIUM DENSE TO DENSE SANDS OR STIFF TO VERY STIFF SILTS, OR COMPACTED STRUCTURAL FILL.
3. ALL SOIL FILL OR BACKFILL MATERIAL SUPPORTING FLOORS OR STRUCTURE SHALL BE STRUCTURAL FILL AND MUST BE APPROVED FOR USE BY THE ARCHITECT.
4. STRUCTURAL FILL FOR FOOTINGS AND FLOOR SLABS-ON-GRADE IS TO BE COMPACTED TO A DENSE UNYIELDING SURFACE TO AT LEAST 90% OF ITS MODIFIED PROCTOR MAXIMUM DRY DENSITY (ASTM D 1557).
5. STRUCTURAL FILL FOR BACKFILL OF BASEMENT WALLS IS TO BE COMPACTED TO A DENSE UNYIELDING SURFACE TO BETWEEN 88% AND 90% OF ITS MODIFIED PROCTOR MAXIMUM DRY DENSITY.
6. ALL STRUCTURAL FILL IS TO BE PLACED IN 8-IN. MAXIMUM, LOOSE, LEVEL, UNIFORM LIFTS IN PREPARATION FOR COMPACTION.

STRUCTURAL CONCRETE

1. CAST-IN-PLACE CONCRETE SHALL CONFORM TO AMERICAN CONCRETE INSTITUTE STANDARD 301 (ACI 301-84), "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS."
2. ALL STRUCTURAL CONCRETE SHALL HAVE AGGREGATES CONFORMING TO ASTM C 33 AND SHALL HAVE A WATER-REDUCING NON-AIR-ENTRAINING ADMIXTURE (PLASTIMENT OR POZZOLITH) ADDED AS RECOMMENDED BY THE MANUFACTURER.
3. DESIGN MIXES FOR THE FOLLOWING CLASSES OF CONCRETE, INCORPORATING CEMENT OF ONE BRAND THROUGHOUT, TOGETHER WITH THE REQUIRED ADMIXTURE, SHALL BE PROPORTIONED ACCORDING TO METHOD 1 OR METHOD 2, PER ACI 301, FOR A SLUMP 1 IN. GREATER THAN THE MAXIMUM FOR EACH CLASS THAT IS TABULATED. THE MIXES SHALL BE TESTED AND APPROVED PRIOR TO USE.

CLASS	LOCATION	MIN COMPRESSIVE STRENGTH @ 28 DAYS (PSI)	MIN CONTENT 94 LB SACKS PER CU YD	CEMENT MAX SLUMP (IN.)	MIN AIR CONTENT
1	FOOTINGS	3000	5	4	---
2	ALL OTHERS INCLUDING SLAB-ON-GRADE FLOORS	4000	5-1/2	3	---

THE APPROVED MIX DESIGN PROPORTIONS SHALL NOT BE MODIFIED TO SUIT PUMPING. OBTAIN APPROVAL OF THE CONTRACTING OFFICER BEFORE MAKING ANY ADJUSTMENTS IN THE DESIGN MIX.

4. REINFORCING STEEL FOR CONCRETE SHALL CONFORM TO ASTM A 615, GRADE 60.
5. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185.
6. REINFORCING MARKED "CONT." (CONTINUOUS) SHALL BE LAP SPLICED 2 FT 6 IN. MINIMUM.
7. REFER TO ARCHITECTURAL, ELECTRICAL, MECHANICAL, AND STRUCTURAL DRAWINGS FOR ALL INSERTS, GROOVES, ETC., TO BE CAST IN CONCRETE AND FOR LOCATION OF PIPES, DUCTS, CONDUITS, ETC.

STRUCTURAL STEEL

1. ALL STEEL CONSTRUCTION SHALL COMPLY WITH THE CODES AND STANDARDS CONTAINED IN THE AISC MANUAL OF STEEL CONSTRUCTION, EIGHTH EDITION AND CONFORM TO THE FOLLOWING:

STRUCTURAL STEEL SHAPES AND PLATES	ASTM A 36, FY = 36 KSI
STRUCTURAL TUBING (SQUARE OR RECTANGULAR)	ASTM A 500, FY = 46 KSI, GR B
STEEL PIPE, TYPE E OR S, GRADE B	ASTM A 53, FY = 35 KSI
HANGER RODS, BOLTS UNLESS OTHERWISE NOTED	ASTM A 307, FY = 33 KSI

2. THE MINIMUM FRAMING CONNECTION IS TWO ROWS BOLTED PER TABLE II-A.
3. WELDS AND ELECTRODES SHALL BE IN ACCORDANCE WITH THE LATEST RECOMMENDATIONS OF AWS AND AISC, SUITABLE TO THE PARTICULAR MATERIALS AND SITUATIONS. USE ONLY E70, LOW-HYDROGEN ELECTRODES.
4. WELDERS SHALL BE CERTIFIED BY AWS QUALIFICATION TEST OR APPROVED EQUAL. SUBMIT EVIDENCE OF CERTIFICATION.
5. BOLTS SET IN CONCRETE OR FASTENING WOOD TO STEEL SHALL TYPICALLY CONFORM TO ASTM A 307.

MASONRY

1. ALL MASONRY ELEMENTS SHALL BE REINFORCED SO AS TO QUALIFY AS REINFORCED MASONRY, SEE TYPICAL DETAILS DRAWING S6.
2. CONCRETE MASONRY UNITS SHALL BE MEDIUM OR NORMAL WEIGHT UNITS CONFORMING TO ASTM C 90, GRADE N, TYPE I.
3. CONCRETE MASONRY UNITS SHALL BE TESTED ACCORDING TO ASTM METHOD C 140, AND OBTAIN A MINIMUM COMPRESSIVE STRENGTH ON THE UNIT OF 1500 PSI (NET AREA).
4. MORTAR SHALL CONFORM TO ASTM C 270, TYPE S, WITH 1800-PSI COMPRESSIVE STRENGTH AT 28 DAYS.
5. GROUT SHALL CONFORM TO ASTM C 476, WITH A COMPRESSIVE STRENGTH OF 2000 PSI AT 28 DAYS. COARSE AGGREGATE IS TO BE 3/8 IN. MAXIMUM. GROUT SHALL BE A CONSISTENCY SUITABLE FOR PUMPING AND FLOWING INTO ALL VOIDS WITHOUT SEGREGATION.
6. DEFORMED BAR REINFORCING: ASTM A 615, GRADE 60.
7. HORIZONTAL JOINT REINFORCEMENT: LADDER TYPE WITH 3/16-IN.-DIAMETER DEFORMED SIDE RODS TO WHICH ARE WELDED NO. 9 GAUGE CROSS BARS OF ASTM A 82 WIRE.
8. THE GROUTING PROCEDURE SHALL BE LOW-LIFT GROUTED CONSTRUCTION MAXIMUM POUR HEIGHT = 4 FT 0 IN.
9. ALL CELLS CONTAINING REINFORCING ARE TO BE GROUTED. TAKE CARE TO KEEP THE VERTICAL CELLS FREE OF DEBRIS.
10. BOTH MORTAR AND GROUT SHALL BE SAMPLED AND TESTED ACCORDING TO UBC STANDARD NO. 24-22. ONE TEST OF BOTH MORTAR AND GROUT SHALL BE MADE FOR EACH 5000 SQ FT OF WALL. ONE TEST MINIMUM FOR EACH DAY OF WORK, FOUR (4) TESTS OF EACH TYPE MINIMUM FOR ALL THE WORK ON THE BUILDING. A MINIMUM OF THREE SPECIMENS OF EACH TYPE IS REQUIRED FOR EACH TEST.
11. THE ARCHITECT SHALL BE NOTIFIED 48 HOURS PRIOR TO GROUTING OPERATION SO THAT SPECIAL INSPECTIONS MAY BE PROVIDED PRIOR TO AND DURING THE GROUTING OPERATIONS.
12. UNLESS OTHERWISE DETAILED OR NOTED ON THE STRUCTURAL DRAWINGS, MASONRY UNITS SHALL BE LAID UP IN ONE-HALF RUNNING BOND WITH ALL INTERSECTIONS OF WALLS MADE BY BONDING THE MASONRY UNITS.

LUMBER, PLYWOOD, AND DIAPHRAGM CONSTRUCTION

1. FRAMING LUMBER (FOR STUDS, JOISTS, NAILERS, BLOCKING, ETC.) SHALL BE GRADED ACCORDING TO THE WEST COAST LUMBERMAN'S ASSOCIATION "STANDARD GRADING RULES NO. 16," WITH ADDENDA TO DATE. NOMINAL MEMBER SIZES ARE GIVEN ON PLAN (2 x 4, 2 x 6, ETC.)
   A. COMMERCIAL GRADE LUMBER SHALL BE FURNISHED ACCORDING TO THE FOLLOWING SIZES AND SPECIES:

MEMBER THICKNESS	SPECIES	COMMERCIAL GRADE
2x*, 4x	DOUGLAS FIR, LARCH	NO. 2 OR BETTER**
6x	DOUGLAS FIR, LARCH	NO. 1 OR BETTER

   *B. MAXIMUM MOISTURE CONTENT = 19%, "DRY."

   **C. 2 x 4 STUDS, NAILERS, OR BLOCKING MAY BE "STANDARD" GRADE OR BETTER AND 2 x 6 STUDS, NAILERS, OR BLOCKING MAY BE NO. 3 GRADE OR BETTER.

   D. ALL PLATES ON CONCRETE TO BE PRESERVATIVE TREATED. SEE SPECIFICATIONS FOR TREATMENT.

2. PLYWOOD
   A. MATERIALS, MANUFACTURER, AND QUALITY CONTROL SHALL BE IN CONFORMANCE WITH U.S. DEPARTMENT OF COMMERCE "VOLUNTARY PRODUCT STANDARDS PS 1-83, CONSTRUCTION AND INDUSTRIAL PLYWOOD." ALL PANELS SHALL BE IDENTIFIED WITH THE MARK OF A QUALIFIED AGENCY INDICATING CONFORMANCE WITH THIS STANDARD.
   B. ALL PLYWOOD (FOR SUBFLOORING, WALL, AND ROOF SHEATHING) SHALL BE C-D INT (EXTERIOR GLUE) UNLESS OTHERWISE NOTED.
   C. SEE STRUCTURAL DRAWINGS FOR NAILING REQUIREMENTS TO ENSURE DIAPHRAGM PERFORMANCE.
   D. COORDINATE THE INSTALLATION OF DECKING AND PLYWOOD DIAPHRAGM SO THAT THE ROOFER FOLLOWS IMMEDIATELY TO MINIMIZE EXPOSURE TO WEATHER.
3. FRAMING DETAILS AND CONNECTIONS
   A. PREENGINEERED HOLDDOWNS, COLUMN BASES, COLUMN CAPS, AND OTHER FRAMING HARDWARE SHALL BE AS MANUFACTURED BY SIMPSON COMPANY, SAN LEANDRO, CALIFORNIA, IN LOCATIONS SHOWN ON DRAWINGS. OTHER BRANDS WILL BE APPROVED IF STRENGTHS ARE SHOWN EQUAL AND ACCOMPANIED BY A SUITABLE ICBO REPORT. INSTALL HARDWARE USING ALL FASTENERS (BOLTS AND NAILS) AS FURNISHED OR RECOMMENDED WITH EACH ITEM. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE DIMENSIONS OF ALL HARDWARE, AS RELATED TO FITUP OF MEMBERS AND THEIR SIZES, PRIOR TO ORDERING HARDWARE.
   B. WASHERS SHALL BE PROVIDED FOR UNDER ALL BOLT HEADS AND NUTS BEARING ON WOOD.
   C. UNLESS OTHERWISE NOTED, ALL NAILS SPECIFIED ON THE DRAWINGS AND IN THE UBC SHALL BE COMMON WIRE NAILS.
   D. MINIMUM NAILING OF LIGHT FRAMING SHALL BE AS SPECIFIED IN 1985 UBC TABLE 25Q. HEAVIER NAILING SHALL BE USED WHERE NOTED ON PLANS.
4. DIAPHRAGM CONSTRUCTION
   A. THE ROOFS AND FLOORS OF THE STRUCTURE ARE ENGINEERED DIAPHRAGMS. IT IS THE INTENT OF THE STRUCTURAL DRAWINGS THAT ALL ROOF AREAS IN PLAN BE RECTANGLES OR A COMBINATION OF RECTANGLES. EACH AGGREGATE RECTANGLE SHALL BE BOUNDED AT THE UNDERSIDE OF PLYWOOD BY AT LEAST TWO TOP PLATES OR BAND JOISTS. WHERE NECESSARY, INSTALL BLOCKING BETWEEN THE PLYWOOD AND PLATES/BAND JOISTS.
   B. THESE PLATES/BAND JOISTS SHALL BE SPLICED TOGETHER SO THAT CONTINUOUS TENSION MEMBERS ARE FORMED. IN ADDITION TO THE NAILING GIVEN IN TABLE 25Q, THE MINIMUM ACCEPTABLE SPLICE FOR THESE BOUNDARY MEMBERS IS TWELVE 10d NAILS EACH SIDE OF JOINT. THE NAILS SHALL BE INSTALLED IN SUCH A MANNER THAT THEIR PENETRATION IS WHOLLY WITHIN THE MATERIAL TO BE CONNECTED.
   C. ROOF CONSTRUCTION: 1/2-IN. PLYWOOD FOR ROOFING (FASTENED ACCORDING TO DIAPHRAGM SCHEDULE) WITH FACE GRAIN RUNNING PERPENDICULAR TO SUPPORTS SHALL BE INSTALLED WITH 1-PLY CLIP AT MIDSPAN OF PLYWOOD EDGES WHEN SUPPORTS ARE SPACED OVER 24 IN. ON CENTER. BLOCKING SHALL BE PROVIDED AS NOTED ON THE ROOF FRAMING PLANS AND DIAPHRAGM SCHEDULE.
   D. FLOOR CONSTRUCTION: 1-1/8-IN. T&G PLYWOOD SUBFLOORING (FASTENED ACCORDING TO DIAPHRAGM SCHEDULE) WITH FACE GRAIN RUNNING PERPENDICULAR TO SUPPORTS. GLUE TO SUPPORTS USING ONLY ADHESIVES CONFORMING TO APA SPECIFICATION AFG-01 AND APPLIED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.

GLUED LAMINATED TIMBER

EXACT MEMBER SIZES ARE GIVEN ON PLAN: 3-1/8 x 13-1/2, 5-1/8 x 12, ETC.

1. ALL STRUCTURAL GLUED LAMINATED TIMBER SHALL BE FURNISHED AS SHOWN DETAILED ON THE PLANS FOR DRY CONDITION OF SERVICE.
2. MATERIALS MANUFACTURE AND QUALITY CONTROL SHALL BE IN CONFORMANCE WITH ANSI/AITC STANDARD A 190.1 FOR "STRUCTURAL GLUED LAMINATED TIMBER." ALL PRINCIPAL MEMBERS SHALL BE MARKED WITH AN AITC QUALITY MARK INDICATING CONFORMANCE WITH THIS STANDARD.
3. LUMBER FOR LAMINATING SHALL BE DOUGLAS FIR, COAST REGION. BENDING MEMBERS (BEAMS AND PURLINS) SHALL BE MADE WITH A COMBINATION OF LAMINATIONS CONFORMING TO "COMBINATION SYMBOL 22F" AS GIVEN IN TABLE 1 OF AITC 117-79. GLU LAM MEMBERS SPANNING VERTICALLY TO HAVE TENSION LAMINATIONS ON BOTH FACES OF MEMBER.
4. USE ONLY WATERPROOF, EXTERIOR GLUE FOR LAMINATING ALL MEMBERS.
5. MEMBERS EXPOSED TO VIEW SHALL BE ARCHITECTURAL APPEARANCE GRADE. MEMBERS THAT ARE CONCEALED FROM VIEW SHALL BE INDUSTRIAL APPEARANCE GRADE.
6. UNLESS OTHERWISE SPECIFIED, A COAT OF END SEALER SHALL BE APPLIED TO THE ENDS OF ALL MEMBERS AS SOON AS PRACTICABLE AFTER END TRIMMING. SURFACES OF MEMBERS SHALL BE SEALED WITH SEALER COAT.
7. ALL GLUE LAMINATED MEMBERS TO BE SHOP FABRICATED ACCORDING TO APPROVED SHOP DRAWINGS. SHOP WORK TO INCLUDE CUTTING TO LENGTH, KERFS, DAPS, PREDRILLING HOLES, COUNTER BORES AND END SEALING.

WOOD BEARING WALL NOTES

1. ALL LOAD-BEARING WALLS SHALL CONSIST OF 2 x 6 STUDS AT 24 IN. ON CENTER UNLESS OTHERWISE NOTED.
2. ALL EXTERIOR AND SOME INTERIOR WALLS (SEE WALL SCHEDULE) ARE SHEATHED WITH PLYWOOD (FACE GRAIN RUNNING PERPENDICULAR TO STUDS).
3. ALL WALLS WITH PLYWOOD SHEATHING SHALL HAVE 2x FULL STUD WIDTH BLOCKING OR 2 x 3 MINIMUM FLATWISE BLOCKING AT EACH JOINT BETWEEN PLYWOOD PANELS UNLESS OTHERWISE NOTED. FULL STUD WIDTH BLOCKING AT 8 FT ON CENTER MAXIMUM.
4. ALL SHEATHED WALLS SHALL BE BOUNDED BY AT LEAST TWO 2x FULL STUD WIDTH MEMBERS TO PROVIDE A 3-IN.-WIDE NAILING SURFACE AT ALL EDGES OF WALLS AND OPENINGS. TYPICALLY, USE FOUR STUDS AT CORNERS.
5. ALL INTERIOR BEARING WALLS WITHOUT PLYWOOD SHEATHING SHALL HAVE BRIDGING (2x FULL WIDTH OF STUD-STAGGERED BLOCKING) AT 4 FT ON CENTER VERTICAL.
6. FOR INTERIOR NON-LOAD-BEARING PARTITIONS (NOT SHOWN ON STRUCTURAL DRAWINGS) PROVIDE

HEIGHT OF WALL (BETWEEN PLATES)	STUDS	STAGGERED BRIDGING AT MIDHEIGHT
10'-0" AND LESS	2 x 4 AT 16" OC	2 x 4 BLOCKING
OVER 10'-0"	2 X 6 AT 16" OC	2 X 6 BLOCKING

FABRICATION AND ERECTION

1. SHOP DRAWINGS FOR FABRICATION OF ELEMENTS SHALL BE PREPARED CONSIDERING THE FINAL POSITION IN THE STRUCTURE RELATIVE TO OTHER CONTIGUOUS ELEMENTS. THIS INCLUDES, BUT IS NOT LIMITED TO, DIMENSION AND CONNECTIONS.
2. DIMENSIONS SHALL BE VERIFIED IN FIELD TO ENSURE PROPER FIT.
3. THE BUILDING FRAME (FOOTINGS, WALLS, FLOORS, AND ROOF SYSTEM) HAS BEEN DESIGNED TO WITHSTAND THE DESIGN LOADS WITHOUT EXCEEDING ALLOWABLE STRESSES. CONTRACTOR SHALL TEMPORARILY BRACE INCOMPLETE PARTS OF STRUCTURE UNTIL SUCH TIME AS BUILDING FRAME AS A WHOLE IS COMPLETE.
4. THE ROOF STRUCTURE MAY BE FABRICATED AND ERECTED AS SUBUNITS. CONTRACTOR SHALL PROVIDE ALL TEMPORARY LATERAL BRACING THAT IS NEEDED FOR HANDLING AND LATERAL SUPPORT UNTIL THE STRUCTURE IS COMPLETE.
5. THE DESIGN CRITERIA OF THE SWIMMING POOL WALLS ARE UNKNOWN. IN ORDER TO MINIMIZE UNBALANCED LATERAL LOADING ON POOL WALLS, THE DIVING BOWL AND LAP POOL SHALL REMAIN FILLED WITH WATER DURING THE CONSTRUCTION PERIOD. CONSTRUCTION LOADS MAY NOT BE PLACED CLOSER THAN 4 FT 0 IN. TO THE EDGE OF THESE POOLS.

STRUCTURAL DRAWING LIST

REGISTERED ARCHITECTS
STATE OF WASHINGTON

HAL MOE POOL ENCLOSURE

STRUCTURAL NOTES

THE TSANG PARTNERSHIP, INC.
☐ SEATTLE ☐ TACOMA
1221 SECOND AVENUE SUITE 100 SEATTLE, WA 98101 (206) 343-3044 FAX (206) 684-9599
748 MARKET STREET SUITE 300 TACOMA, WA 98402 (206) 272-9383 FAX (206) 383-8059

DATE: 8-8-89
REVISED:
SHEET NO.: S1