CITY OF PORTLAND, OREGON - BUREAU OF DEVELOPMENT SERVICES

1900 SW Fourth Avenue, Suite 5000 • Portland, Oregon 97201 • www.portlandonline.com/bds • Fax 503-823-7425

Facility Permit Plan Intake Form

FOR INTAKE, STAFF USE ONLY

Date Received 6/11/13

Building Registration #

Fixed Bid

Bin # F10

Building Permit #

Mechanical # 13-128041-MFS-01-EA

Plumbing Permit #

Electrical Permit #

Building/Mechanical Dave R 1

Electrical

Plumbing

Fire

Planning

BES

PDOT

Structural Fred/Eric 2

Other

APPLICANT: Complete all sections below that apply to the project. Please print legibly.

Print Name Al Schweitzer Sign Name A.J. Schweitzer

Street Address 1498 SE Tech Center Place (Suite 180)

City Vancouver State WA Zip Code 98683

Day Phone (971) 563-7764 FAX (360) 896-3849 email als@totalmechanical.com

Plans / permits available for pick up at 1900 SW 4th Avenue, 2nd floor between 8:00 am to 5:00 pm

Contact Name for plan/permit pick up Al Schweitzer

Day Phone (971) 563-7764 email als@totalmechanical.com

Project Building Name / # Legacy Good Samaritan Hospital West Wing

Project Address or Location 1015 NW 22nd Ave, Portland, Or 97210

Project Name and Description Legacy Good Samaritan West Wing Cooling Towers CT-1 & CT-2 Replacement DEFERRED SEISMIC SUBMITTAL - BRACING

Total Project Value $562,359.00 Project Reference #/Billing ID # PO #2000212635

Building Contractor CCB #

MechanicalContractor Total Mechanical Inc CCB # 30066

Electrical Contractor CCB# License #

Plumbing Contractor Total Mechanical Inc CCB# 30066 License # 26-238PB

☐ **Building Permit**

No. of Stories

Const. Type

[Y] [N] Alarms Required

[Y] [N] Smoke Det. Req'd

[Y] [N] Sprinklers Req'd

[Y] [N] Struct. Eng / Calcs Submitted

☒ **Mechanical Permit**

Mechanical Valuation $528,499.00

Description Replace Cooling Towers CT-1 & CT-2

☐ **Electrical Permit**

Please provide a completed standard electrical permit application form. You may mail or deliver it to 1900 SW 4th Avenue, Portland, Oregon 97201 or FAX to 503-823-7425.

☒ **Plumbing Permit**

Number of Fixtures 1) 4" Hub Drain

Back Flow Devices

Water Service (# of Feet)

Medical Gas

Other

City of Portland REVIEWED FOR CODE COMPLIANCE AUG 08 2013 13-128041-MFS-EA Permit Number

GENERAL NOTES

1. WHERE BRACE ELEMENTS ARE THROUGH-BOLTED, THE MOUNTING HOLE IN THE ELEMENT IS TO BE NO MORE THAN 1/16" IN DIAMETER LARGER THAN THE BOLT OR THREADED ROD.
2. AVOID BRACING TO STRUCTURAL ELEMENTS WHICH MAY RESPOND DIFFERENTLY IN A SEISMIC EVENT.
3. THE ENGINEER OF RECORD FOR THE BUILDING SHALL REVIEW THE ISAT ATTACHMENT DETAILS AND LOADS TO DETERMINE THE SUITABILITY OF THE STRUCTURE TO ACCEPT SUCH LOADS PRIOR TO INSTALLATION OF THE SEISMIC BRACING SYSTEM.
4. WHEN UTILIZING CABLE BRACING FOR OTHER THAN VIBRATION ISOLATED SYSTEMS, TENSION THE CABLE TO REMOVE SLACK WITHOUT INDUCING UPLIFT OF THE SUSPENDED ELEMENT. CABLE INSTALLATION IS TO BE SYMMETRICAL.
5. AS A GENERAL RULE, DO NOT MIX RIGID BRACING AND CABLE BRACING IN THE SAME RUN. HOWEVER, ONCE BRACING HAS MADE A 90 DEGREE CHANGE IN RUN DIRECTION, THE BRACING TYPE MAY SWITCH FROM RIGID TO CABLE OR VICE VERSA.
6. BRACING TABLES IN THE ISAT MANUAL ARE BASED ON A NOMINAL BRACE ANGLE OF 45 DEGREES FROM HORIZONTAL +/- 2.5 DEGREES. BRACE ANGLES LESS THAN 45 DEGREES ARE ACCEPTABLE WITHOUT MODIFICATION. BRACE ANGLES GREATER THAN 47.5 DEGREES AND LESS THAN 60 DEGREES FROM HORIZONTAL ARE ACCEPTABLE; HOWEVER, THE TABULATED BRACE SPACING AND ANCHORAGE LOADS WILL REQUIRE MODIFICATION BY ISAT TECHNICAL SUPPORT.
7. BRACING MAY BE INSTALLED WITH UP TO +/- 7-½ DEGREES VARIATION FROM "TRUE" TRANSVERSE OR "TRUE" LONGITUDINAL ALIGNMENT WITHOUT THE NEED FOR ADDITIONAL ENGINEERING. REFER TO INSTALLATION DETAILS.
8. UN-BRACED SUSPENDED UTILITIES ARE TO HAVE A 6" MINIMUM CLEARANCE TO CEILING SUPPORT WIRES.
9. SEISMIC BRACING MAY NOT PASS THROUGH A STRUCTURAL SEISMIC SEPARATION JOINT. UTILITY SYSTEMS THAT PASS THROUGH A SEISMIC SEPARATION JOINT MUST BE SEISMICALLY RESTRAINED WITHIN 5 FEET OF BOTH SIDES OF THE SEPARATION OR WITHIN 5 FEET OF POINT OF CONNECTION OF ANY HARDWARE DESIGNED TO ACCOMMODATE SEISMIC MOVEMENT ACROSS THE SPAN OF THE SEPARATION JOINT.
10. WITH THE APPROVAL OF THE ENGINEER OF RECORD, UTILITY SYSTEMS THAT ARE SUSPENDED FROM THE OVERHEAD DECK MAY BE BRACED TO CONCRETE SHEAR WALLS PROVIDED THAT THE WALLS AND THE OVERHEAD DECK WILL RESPOND SIMILARLY DURING A SEISMIC EVENT. CONSULT WITH STRUCTURAL ENGINEER OF RECORD FOR APPROVAL. OVERHEAD CONCRETE DECK ANCHOR DETAILS MAY BE UTILIZED FOR WALL ATTACHMENT.
11. WHERE THE CODE ALLOWS SEISMIC RESTRAINTS TO BE OMITTED FROM A COMPONENT, PROVISIONS SHALL BE MADE TO AVOID SEISMIC IMPACT WITH OTHER COMPONENTS OR IMPACT WITH ELEMENTS OF THE BUILDING STRUCTURE. IMPACT RISK ANALYSIS OF NON-BRACED COMPONENTS TO BE BY OTHERS.
12. BRACE LOCATIONS MAY BE FIELD RELOCATED TO AN ALTERNATE SUPPORT LOCATION WITHIN THE SAME UTILITY RUN WHEN THE LENGTH OF THE UTILITY TRIBUTARY TO THE BRACE DOES NOT EXCEED THE BRACE SPACING TABULATED IN THE ISAT RESTRAINT LEGEND. ANCHORAGE AND SUPPORT ROD DETAILS ARE TO BE TAKEN FROM THE BRACING LEGENDS.
13. WHEN USED TO CONSTRUCT A RIGID BRACE ARM ASSEMBLY, MINIMUM 12 GAUGE STEEL CHANNEL SHALL BE UTILIZED, REFER TO SEISMIC LEGEND AND ISAT H2 DETAIL FOR CHANNEL PROFILE.
14. ANY DEVIATION FROM THE ISAT BRACING TABLES OR ISAT INSTALLATION DETAILS SHALL ONLY BE MADE USING SOUND DESIGN PRACTICES BY A QUALIFIED ENGINEER WITH THE APPROVAL OF THE ENGINEER OF RECORD AND THE CODE AUTHORITY HAVING JURISDICTION, SUBJECT TO LOCAL CODE REQUIREMENTS.
15. WHERE SPECIFICATION OR JOB REQUIREMENTS DEVIATE FROM THOSE SHOWN IN THE ISAT *MANUAL*, THE MORE STRINGENT REQUIREMENT SHALL PREVAIL.

APPLICABLE CODES

1. 2010 OREGON STRUCTURAL SPECIALTY CODE (OSSC).
2. 2009 INTERNATIONAL BUILDING CODE (IBC).
3. ASCE 7-05, CHAPTER 13, MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES, AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE).
4. ACI 318-08, BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, AMERICAN CONCRETE INSTITUTE (ACI).

QUALITY ASSURANCE

1. ARCHITECT OR ENGINEER OF RECORD IS TO PROVIDE A "STATEMENT OF SPECIAL INSPECTIONS" IN CONFORMANCE WITH 2009 IBC.
2. EACH CONTRACTOR RESPONSIBLE FOR THE CONSTRUCTION OF A "DESIGNATED SEISMIC SYSTEM" OR A SEISMIC RESISTING COMPONENT LISTED IN THE "STATEMENT OF SPECIAL INSPECTIONS" SHALL SUBMIT TO THE BUILDING OFFICIAL AND OWNER PRIOR TO THE COMMENCEMENT OF WORK ON THE SYSTEM OF COMPONENT A WRITTEN 'STATEMENT OF RESPONSIBILITY" PER IBC.
3. CONSULT ISAT TECHNICAL SERVICE WHEN FIELD CONDITIONS PROHIBIT COMPLIANCE WITH THE SUPPLIED INSTALLATION DETAILS.
4. WHERE SEISMIC BRACING IS ALLOWED TO BE OMITTED, CONSEQUENTIAL DAMAGE DUE TO IMPACT OR VERTICAL SUPPORT FAILURE SHALL BE EVALUATED. ASSESSMENT AS TO CONFORMANCE WITH THIS REQUIREMENT IS OUTSIDE ISAT'S SCOPE OF RESPONSIBILITY.
5. ISAT TO PROVIDE A LETTER AFTER FINAL JOBWALK FOR GENERAL COMPLIANCE.
6. ISAT MATERIALS AND DESIGN WORK ARE PRODUCED WITH A DEGREE OF CARE AND SKILL ORDINARILY EXERCISED BY OTHER REPUTABLE MEMBERS OF OUR PROFESSION. NO OTHER WARRANTY, EXPRESSED OR IMPLIED, IS MADE.

SPECIAL INSPECTIONS

1. SPECIAL INSPECTION REQUIREMENTS: ALL DESIGNATED SEISMIC SYSTEMS ARE SUBJECT TO SPECIAL INSPECTION PER IBC CHAPTER 17 SECTION 1707.
2. PER 2006-09 INTERNATIONAL BUILDING CODE:
   - A. THE OWNER OR THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE ACTING AS THE OWNER'S AGENT SHALL EMPLOY ONE OR MORE SPECIAL INSPECTORS TO PROVIDE INSPECTIONS DURING CONSTRUCTION.
   - B. THE PERMIT APPLICANT SHALL SUBMIT A STATEMENT OF SPECIAL INSPECTIONS PREPARED BY THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE AT PERMIT PHASE, THE STATEMENT OF SPECIAL INSPECTION SHALL INCLUDE SEISMIC REQUIREMENTS FOR THE FOLLOWING CASES:
     DESIGNATED SEISMIC SYSTEMS IN STRUCTURES ASSIGNED TO SEISMIC DESIGN CATEGORY D, E, F.
     THE FOLLOWING ADDITIONAL SYSTEMS AND COMPONENTS IN STRUCTURES ASSIGNED TO SEISMIC DESIGN CATEGORY C, D, E & F:
     - HEATING, VENTILATING AND AIR-CONDTIONING (HVAC) DUCTWORK CONTAINING HAZARDOUS MATERIALS AND ANCHORAGE OR SUCH DUCTWORK.
     - PIPING SYSTEMS AND MECHANICAL UNITS CONTAINING FLAMMABLE, COMBUSTIBLE OR HIGHLY TOXIC MATERIALS
     - ANCHORAGE OF ELECTRICAL EQUIPMENT USED FOR EMERGENCY OR STANDBY POWER SYSTEMS.
3. SPECIAL INSPECTION FOR MECHANICAL AND ELECTRICAL COMPONENTS SHALL BE PROVIDED AS FOLLOWS:
   - A. FOR ALL DESIGNATED SEISMIC SYSTEMS WITHIN SEISMIC DESIGN CATEGORIES D, E OR F
   - B. PERIODIC SPECIAL INSPECTION DURING THE ANCHORAGE OF ELECTRICAL EQUIPMENT FOR EMERGENCY OR STANDBY POWER SYSTEMS IN STRUCTURES ASSIGNED TO SEISMIC DESIGN CATEGORIES C, D, E OR F.
   - C. PERIODIC SPECIAL INSPECTION DURING THE INSTALLATION OF ANCHORAGE OF ALL OTHER ELECTRICAL EQUIPMENT IN SEISMIC DESIGN CATEGORIES E OR F.
   - D. PERIODIC SPECIAL INSPECTION DURING THE INSTALLATION FOR FLAMMABLE, COMBUSTIBLE OR HIGHLY TOXIC PIPING SYSTEMS AND THEIR ASSOCIATED MECHANICAL UNITS IN SEISMIC DESIGN CATEGORIES C, D, E OR F.
   - E. PERIODIC SPECIAL INSPECTION DURING THE INSTALLATION OF HVAC DUCTWORK THAT WILL CONTAIN HAZARDOUS MATERIAL IN SEISMIC DESIGN CATEGORIES C, D, E OR F.
   - F. PERIODIC SPECIAL INSPECTION DURING THE INSTALLATION OF VIBRATION ISOLATION SYSTEMS WHERE THE CONSTRUCTION DOCUMENTS INDICATE A MAXIMUM CLEARANCE (AIR GAP) BETWEEN THE EQUIPMENT SUPPORT FRAME AND RESTRAINT LESS THAN OR EQUAL TO 1/4 INCH.
4. UPON COMPLETION OF CONSTRUCTION A QUALITY ASSURANCE REPRESENTATIVE OF ISAT SHALL REVIEW THE INSTALLATION OF THE SEISMIC-FORCE-RESISTING SYSTEM AND PROVIDE DOCUMENTATION INDICATING GENERAL CONFORMANCE TO SEISMIC RESTRAINT LAYOUT DRAWING.

SEISMIC BRACING REQUIREMENTS FOR SUSPENDED MEP UTILITIES (SEISMIC DESIGN CATEGORY D, E, OR F)

Ip	SUSPENDED HVAC DUCT
≥1.0	BRACE DUCT HAVING A CROSS-SECTIONAL AREA 6 FT² OR GREATER
Ip	**SUSPENDED ELECTRICAL UTILITY**
≥1.0	BRACE CONDUIT GREATER THAN 2.5" TRADE SIZE
	BRACE TRAPEZE ASSEMBLIES SUPPORTING MORE THAN 10 Lbs/Lf
Ip	**SUSPENDED MECHANICAL PIPING AND PLUMBING**
1.0	BRACE ALL PIPE GREATER THAN 3" DIAMETER
>1.0	BRACE ALL PIPE GREATER THAN 1" DIAMETER
≥1.0	BRACE TRAPEZE ASSEMBLIES SUPPORTING MORE THAN 5 Lbs/Lf
Ip	**SUSPENDED EQUIPMENT**
1.0	BRACE ALL SUSPENDED EQUIPMENT GREATER THEN 75 Lbs
≥1.0	BRACE ALL EQUIPMENT REGARDLESS OF WEIGHT

SEISMIC BRACING REQUIREMENTS FOR SUSPENDED MEP UTILITIES

1. SEISMIC RESTRAINTS ARE NOT REQUIRED FOR UTILITIES SUPPORTED BY ROD HANGERS IF THE FOLLOWING CONDITIONS ARE MET FOR THE FULL LENGTH OF THE RUN:
   - A) THE ROD HANGERS ARE 12" OR LESS IN LENGTH FROM THE TOP OF THE DUCT OR COMPONENT TO THE BOTTOM OF THE STRUCTURAL SUPPORT. HANGERS ARE TO BE DETAILED TO AVOID SIGNIFICANT BENDING OF THE HANGERS AND THEIR ATTACHMENTS.
   - B) PROVISIONS ARE MADE FOR PIPING TO ACCOMMODATE EXPECTED DEFLECTIONS
2. IN ORDER TO SATISFY ASCE 7-05, SECTION 13.1.4 REQUIREMENTS - WHERE BRACING IS ALLOWED TO BE OMITTED, FLEXIBLE CONNECTIONS ARE REQUIRED BETWEEN ANY FIXED JUNCTURE, EQUIPMENT OR COMPONENT AND THE CONNECTING UTILITY.
3. UN-BRACED UTILITIES ATTACHED TO IN-LINE EQUIPMENT SHALL BE PROVIDED WITH FLEXIBLE CONNECTIONS.
4. ALL SEISMIC BRACING ASSEMBLIES SHALL UTILIZE ISAT SEISMIC BRACKETS UNLESS NOTED OTHERWISE. NO **SUBSTITUTIONS ALLOWED**. USE OF ANY SUBSTITUTE BRACKET VOIDS ALL ENGINEERING.
5. EVERY UTILITY RUN WHICH REQUIRES BRACING SHALL HAVE A MINIMUM OF TWO TRANSVERSE BRACES AND ONE LONGITUDINAL BRACE. FOR THE PURPOSES OF THESE DRAWINGS, A RUN IS DEFINED AS A SUSPENDED ELEMENT OF 10 FOOT MINIMUM STRAIGHT LENGTH.
6. A LONGITUDINAL BRACE AT A 90 DEGREE CHANGE IN DIRECTION MAY ACT AS A TRANSVERSE BRACE IF IT IS WITHIN 2 FEET OR DUCT WIDTHS OF THE CHANGE IN DIRECTION OR LOCATED WITHIN PRESCRIBED DISTANCES FROM THE CHANGE IN DIRECTION AS SHOWN ON A4.1, A5.1 AND A6.1. THE BRACE ARM AND ANCHORAGE MUST BE SIZED TO MEET OR EXCEED THE REQUIREMENTS OF THE TABULATED BRACE REACTION.
7. A TRANSVERSE BRACE MAY ACT AS A LONGITUDINAL BRACE IF IT IS LOCATED WITHIN 2 FEET OF THE CHANGE IN DIRECTION OR LOCATED WITHIN PRESCRIBED DISTANCES FROM THE CHANGE IN DIRECTION AS SHOWN ON A4.1, A5.1 AND A6.1. THE BRACE ARM AND ANCHORAGE MUST BE SIZED TO MEET OR EXCEED THE REQUIREMENTS OF THE TABULATED BRACE REACTION.
8. WHERE A DUCT PASSES THROUGH A WALL MAY BE CONSIDERED A TRANSVERSE BRACE LOCATION PROVIDED THE DUCT IS TIGHTLY CONSTRAINED BY THE WALL. THE STRUCTURAL ENGINEER OF RECORD OR THE ARCHITECT OF RECORD MUST VERIFY THE ABILITY OF THE WALL TO ACCOMMODATE THE TRANSVERSE SEISMIC LOAD.

   NEITHER A BREAKAWAY SMOKE DAMPER NOR A FLEXIBLE CONNECTION AT A WALL PENETRATION IS ALLOWED TO BE UTILIZED AS A TRANSVERSE BRACE LOCATION.
9. VERTICAL SUPPORT SPACING FOR SUSPENDED UTILITIES IS TO BE THE LESSER OF 10 FOOT MAXIMUM, OR THE MAXIMUM AS DICTATED BY THE MECHANICAL, ELECTRICAL AND PLUMBING CODES, AS LISTED IN THE PROJECT SPECIFICATIONS, OR AS ALLOWED BY THE LOCAL CODE AUTHORITY.
10. EACH LAYER OF A MULTI-LAYER TRAPEZE RACK SHALL BE BRACED INDIVIDUALLY BASED ON THE WEIGHT OF EACH INDIVIDUAL LAYER.
11. ALL VERTICAL RISER UTILITIES SHALL INCLUDE LATERAL RESTRAINT AT THE TOP AND BOTTOM OF THE RISER AND AT EACH INTERMEDIATE FLOOR, NOT TO EXCEED A MAXIMUM 30 FOOT INTERVAL.
12. VERTICAL RISERS WHICH ARE MECHANICALLY ATTACHED TO FLOORS AT POINT OF PENETRATION ARE CONSIDERED A TRANSVERSE AND LONGITUDINAL BRACE LOCATION WHEN THE ANCHORAGES AND THE DUCT FRAMING ARE SIZED TO ACCOMMODATE THE LATERAL LOAD.
13. CONDUIT OR PIPING CONSTRUCTED OF NON-DUCTILE MATERIALS (E.G., GLASS, NO-HUB CAST IRON, PLASTIC), SHALL HAVE THE BRACE SPACING REDUCED TO ONE-HALF OF THE SPACING ALLOWED FOR DUCTILE MATERIALS AND SHALL BE BRACED ON BOTH SIDES OF A HORIZONTAL, 90 DEGREE CHANGE IN DIRECTION. SEE SPECIFIC ISAT BRACING LEGENDS FOR NON-DUCTILE MATERIAL (REF. SECTION 13.6.11, ASCE 7-05).
14. ALL LONGITUDINAL BRACE LOCATIONS FOR INDIVIDUALLY SUPPORTED PIPE AND CONDUIT SHALL EMPLOY AN ISAT LONGITUDINAL RESTRAINT DEVICE (LRD) AND INSTALLED PER THE INDIVIDUAL DETAIL DRAWINGS WITHIN THESE SHEETS.
15. WHEN USING BACK-TO-BACK 12 GAUGE STEEL CHANNEL AS A TRAPEZE ASSEMBLY FOR GRAVITY LOADS, PIPE AND CONDUIT MAY BE MOUNTED TO BOTH THE TOP AND THE UNDERSIDE OF THE CHANNEL PROVIDED THE LOAD LIMITATIONS ON PAGE G2 ARE NOT EXCEEDED.
16. FOR THE PURPOSE OF CALCULATING WEIGHT, ALL PIPING AND CONDUIT IS TO BE TREATED AS FULL OF WATER.
17. PIPING SYSTEMS EMPLOYING GROOVED COUPLING CONNECTIONS WHICH ARE TESTED AND LISTED ASSEMBLIES PER UL STANDARD 213 MAY EMPLOY THE SAME BRACE SPACING AS WELDED STEEL CONNECTIONS SUBJECT TO THE LIMITS OF THE ISAT BRACING TABLES FOR THE SPECIFIC PIPE SIZE AND HORIZONTAL ACCELERATION. GROOVED PIPE COUPLINGS THAT ARE NON-UL LISTED MUST BE BRACED AT A MAXIMUM SPACING NOT TO EXCEED ONE-HALF THAT ALLOWED FOR WELDED STEEL.
18. UNLESS OTHERWISE NOTED, STANDARD ISAT BRACING DOES NOT INCLUDE ALLOWANCES FOR PIPING SYSTEMS DESIGNED TO ACCOMMODATE THERMAL EXPANSION AND CONTRACTION. THERMAL PIPE STRESS ANALYSIS SHALL BE UNDERTAKEN SEPARATELY BY A LICENSED ENGINEER TRAINED AND AUTHORIZED TO PERFORM SUCH CALCULATIONS.

    THE RESULTS OF THE THERMAL PIPE STRESS ANALYSIS SHALL BE USED TO DETERMINE THE NEED FOR "PIPE ANCHORS AND GUIDES". UNLESS THE HORIZONTAL SEISMIC REACTION HAS BEEN SPECIFICALLY INCLUDED IN THE THERMAL PIPE STRESS ANALYSIS AND THE "ANCHORS AND GUIDES" SIZED TO ACCOMMODATE THE SEISMIC REACTION, TRANSVERSE SEISMIC BRACING SHALL BE INSTALLED PER ISAT GUIDELINES EXCLUSIVE OF THE "ANCHORS AND GUIDES".
19. ON PIPE RUNS DESIGNED TO ALLOW FOR THERMAL EXPANSION AND CONTRACTION, LONGITUDINAL CABLE RESTRAINTS MAY BE INSTALLED IN THE FIELD OF A PIPE RUN WHERE A SPECIFIED AMOUNT OF SLACK IS CREATED TO ONLY ALLOW FOR THERMAL MOVEMENT. CONSULT THE PROJECT MECHANICAL ENGINEER OF RECORD FOR THE LIMITS OF THERMAL MOVEMENT, UNLESS OTHERWISE NOTED.
20. PIPES ON ROLLER HANGERS (OTHER THAN CLEVIS ROLLER HANGERS) SHALL EMPLOY A TOP ROLLER OR U-BOLT ENCIRCLING THE TOP OF THE PIPE AT SEISMIC RESTRAINT LOCATIONS TO PREVENT VERTICAL UPLIFT DURING A SEISMIC EVENT.
21. PIPE AND CONDUIT RISERS SHALL HAVE THE LATERAL SEISMIC RESTRAINT AND THE VERTICAL SUPPORT SHALL BE ENGINEERED ON AN INDIVIDUAL PROJECT BASIS.
22. RE-INSULATE ANY LOCATIONS WHERE PIPE INSULATION HAD BEEN ORIGINALLY REMOVED FOR DIRECT ATTACHMENT OF LONGITUDINAL RESTRAINT DEVICES (LRD) TO PIPE.
23. NO-HUB CAST IRON PIPING, WHEN INSTALL AS A RISER, SHALL INCLUDE THE USE OF A JOINT STABILIZER WHERE THE JOINTS ARE UNSUPPORTED BETWEEN FLOORS. HEAVY DUTY HUSKY BANDS MAY SUFFICE AS JOINT STABILIZERS.

VIBRATION ISOLATED UTILITIES

1. INSTALL VIBRATION ISOLATION HARDWARE PER MANUFACTURER'S INSTRUCTIONS TO ACHIEVE THE REQUIRED DEGREE OF ISOLATION AND/OR DEFECTION.
2. VIBRATION ISOLATED HANGERS THAT ALSO REQUIRE SEISMIC BRACING SHALL BE BRACED USING GALVANIZED STEEL CABLE OR MINIMUM 12 GAGE HANGING WIRE TIED TO ISAT DESIGNED AND TESTED SEISMIC BRACKETS.
3. CABLE TO BE INSTALLED WITH SUFFICIENT SLACK TO ACCOMMODATE, BUT NOT EXCEED, THE VIBRATION ISOLATORS CALCULATED DEFLECTION. SEE MANUFACTURER'S VIBRATION ISOLATOR SPECIFICATIONS. DO NOT TENSION CABLES TO THE EXTENT THAT THEY SUPPORT GRAVITY LOADS. CABLE INSTALLATION IS TO BE SYMMETRICAL.

FASTENERS AND ANCHORS

1. BOLT AND STRUT NUT TORQUE:

   3/8" DIAMETER BOLT 19 FT-LBS
   1/2" DIAMETER BOLT 50 FT-LBS
   5/8" DIAMETER BOLT 100 FT-LBS
2. POST INSTALLED MECHANICAL EXPANSION ANCHOR HOLE DEPTH IS SHOWN ON ISAT DETAILS. THE OBSERVED ANCHOR PROJECTION AFTER THE PROPER TORQUE IS APPLIED MAY INCREASE BY A MAXIMUM OF ONE BOLT DIAMETER. INSTALLATION TORQUE SHALL BE AS SHOWN ON THESE DETAILS.
3. ALL STRUCTURAL STEEL AND ANCHORS EXPOSED TO WEATHER, MOIST CONDITIONS, OR CHEMICAL ATTACK SHALL BE TREATED FOR CORROSION RESISTANCE PER PROJECT SPECIFICATIONS. STAINLESS STEEL ANCHORS RECOMMENDED.
4. RC-1 AND RC-2 ROD STIFFENER TIGHTENING REQUIREMENTS - ROD STIFFENING REQUIRED ONLY FOR HANGER RODS TO WHICH SEISMIC BRACING HAS BEEN INSTALLED. TIGHTEN STIFFENER NUT TO FINGER TIGHT PLUS 2 FULL TURNS OF THE NUT.

STEEL COMPONENT REQUIREMENTS

1. THE DESIGN, FABRICATION AND ERECTION OF STEEL SHALL BE IN ACCORDANCE WITH AISC 360.
2. STEEL SHALL CONFORM TO THE FOLLOWING, UNO,

STEEL PRODUCT	ASTM SPECIFICATION, UNO	COMMENTS
W &WT SHAPES	A992	FY = 50 KSI
M, MT, S, ST, & HP SHAPES	A36	FY = 36 KSI
CHANNELS	A36	FY = 36 KSI
ANGLES	A36	FY = 36 KSI
PLATES & BARS	A36, UNO	FY = 36 KSI
RODS, PLAIN & ALL-THREADED	A36	FY = 36 KSI
BOLTS	A307, GRADE A	FU = 60 KSI
WASHERS	F844	
PLATE WASHERS	A36	FY = 36 KSI
ANCHOR BOLTS & RODS	F1554, CLASS 2A	
(HEADED OR THREADED AND NUTTED)	GRADE 36 TYP, UNO	FY = 36 KSI
WELDED HEADED STUDS	A108, GRADES 1010 - 1020	FY = 50 KSI
SHEAR STUDS, & WELDED THREADED STUDS		
WELD FILLER METAL	PER AWS D1.1	FU = 70 KSI
EYENUTS & EYEBOLTS	AISI C1030	
SLEEVE NUTS	AISI C1018, GRADE 2	
RECESSED NUTS AND PINS	A36	

3. WELDING MATERIALS & PROCEDURES SHALL CONFORM WITH AWS D1.1 FOR STRUCTURAL STEEL AND AWS D1.3 FOR SHEET STEEL.

NOMENCLATURE

ABF	ANGLE BRACKET, FIXED
ABHW	ANCHOR BRACKET, HINGED WELDED
AB45	ANGLE BRACKET, 45 DEGREE (W/ FACTORY TIED WIRE)
AB90	ANGLE BRACKET, 90 DEGREE (W/ FACTORY TIED WIRE)
ACI	AMERICAN CONCRETE INSTITUTE
ASJ	ALL SERVICE JACKET
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASD	ALLOWABLE STRESS DESIGN
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
Anc	ANCHOR
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
ATR	ALL THREAD ROD
AWG	AMERICAN WIRE GAGE
C	CABLE BRACE ARM
CBC	CALIFORNIA BUILDING CODE
CBS	CROSS BOLT SLEEVE
Dia	DIAMETER
DSA	DIVISION OF THE STATE ARCHITECT, CA
Fp	COMPONENT SEISMIC DESIGN FORCE
FSB	FLUTE SPAN BRACKET
Ft, ft	FEET
ft-lbs	FOOT-POUNDS, TORQUE OR MOMENT
Fv	VERTICAL SEISMIC ACCELERATION
G, g	GRAVITATION FORCE
Ga, ga	GAGE
HVAC	HEATING, VENTILATION AND AIR CONDITIONING
IBC	INTERNATIONAL BUILDING CODE
ICC	INTERNATIONAL CODE COUNCIL
Ip	COMPONENT IMPORTANCE FACTOR
ISAT	INTERNATIONAL SEISMIC APPLICATION TECHNOLOGY
L	LONGITUDINAL
Lbs	POUNDS FORCE
lf	LINEAR FOOT
LRD	LONGITUDINAL RESTRAINT DEVICE
LRFD	LOAD AND RESISTANCE FACTOR DESIGN
LWC	LIGHT WEIGHT CONCRETE
m	METER
mm	MILLIMETER
Max	MAXIMUM
MEP	MECHANICAL, ELECTRICAL AND PLUMBING
Mfg	MANUFACTURER
Min	MINIMUM
MSS	MANUFACTURERS STANDARDIZATION SOCIETY
NWC	NORMAL WEIGHT CONCRETE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
OSHPD	OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
P	BRACE REACTION
Ph	BRACE REACTION, HORIZONTAL COMPONENT
plf	POUNDS PER LINEAR FOOT
Pv	BRACE REACTION, VERTICAL COMPONENT
PIP	POURED-IN-PLACE INSERT
Pl	PLATE
PSI, psi	POUNDS PER SQUARE INCH
R	RIGID BRACE ARM
RCC	ROD CAPTURE CABLE BRACKET
RCHW	ROD CAPTURE, HINGE BRACKET
SDF	SEISMIC DESIGN FORCE (Fp)
SDI	STEEL DECK INSERT
s/m	SHEET METAL
SMACNA	SHEET METAL AND AIR-CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
T	TRANSVERSE
TL	TRANSVERSE, LONGITUDINAL
TR	TRAPEZE
TVL	TOTAL VERTICAL LOAD
Wp	COMPONENT OPERATING WEIGHT

SHEET INDEX

SB0.0	SEISMIC BRACING GENERAL NOTES		
SB-0.1	RESTRAINT LEGEND & SDF(S) *E - SERIES INCLUDED		
P1-0.0	PIPING		
SBX-2.1	INSTALLATION DETAILS (B-DETAILS)		
SB-2.1	BRACE ARM ANCHORAGE DETAILS (D, G & H - DETAILS)		

City of Portland
REVIEWED FOR CODE COMPLIANCE
AUG 08 2013
13-128041-DFS-1-FA
Permit Number

SPECIAL INSPECTIONS ARE REQUIRED ON THIS PERMIT FOR THE FOLLOWING AREAS OF CONSTRUCTION:

- ☐ STRUCTURAL STEEL
- ☐ ~~ADHESIVE ANCHORS~~ Post Installed
- ☐ REINFORCED CONCRETE
- ☒ Concrete Anchors
- ☐ STRUCTURAL OBSERVATION BY THE ENGINEER IS TO OCCUR AT THE FOLLOWING STAGES OF CONSTRUCTION:

REGISTERED PROFESSIONAL ENGINEER 84127PE OREGON MAY 11, 2010 GARRIT WAYNE WILSON
6/4/13
EXPIRES: 06/30/ 14

ISAT
INTERNATIONAL SEISMIC APPLICATION TECHNOLOGY

PORTLAND, OR BRANCH
14325 NE AIRPORT WAY #113 PORTLAND, OR 97230
503-252-4423 (US) 503-252-4427 (FAX)

HEADQUARTERS
14848 NORTHAM ST. LA MIRADA, CA 90638
877-999-4728 (US) 714-994-6353 714-523-0845 (FAX)
WWW.ISATSB.COM

"EMPOWERED BY EXPERIENCE"

PROPRIETARY STATEMENT

THESE DRAWINGS/DOCUMENTS HEREIN ATTACHED ARE THE PROPERTY OF I.S.A.T. ANY REUSE OR REPRODUCTION OF THESE DOCUMENTS WITHOUT WRITTEN PERMISSION OF I.S.A.T. IS STRICTLY FORBIDDEN. ALL RIGHTS RESERVED.

PROJECT
LEGACY GOOD SAMARITAN HOSPITAL CT 1 & 2

PROJECT NO: MECHANICAL PIPING

PREPARED FOR:
TOTAL MECHANICAL

REVISION:

REV	BY	ISSUE COMMENTS	DATE
△	KD	COMPLETED	5/30/13
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

SHEET TITLE:
GENERAL NOTES FOR NONSTRUCTURAL SEISMIC BRACING AND SUPPORT 2009 IBC

DRAWN BY: KD

SCALE: NTS
DATE: 6/14/12

DRAWING NO.: **SB0.0**

2
13-128041-DFS-01-FA
F10

ISAT
INTERNATIONAL SEISMIC APPLICATION TECHNOLOGY

SEISMIC DESIGN FORCE (SDF) CALCULATION WORKSHEET
APPLICABLE CODES: 2007 / 2010 / 2013 CBC AND 2006 / 2009 / 2012 IBC (Based on ASCE 7-05/10)
INTERNATIONAL SEISMIC APPLICATION TECHNOLOGY
14848 Northam St., La Mirada, CA 90638
PHONE 877-999-4728 | FAX 714-523-0845

Rev. 1

Project Name: LEGACY GOOD SAMARITAN HOSPITAL - CT 1 & 2 — Date: 5/29/2013
Location: PORTLAND, OR
Project Zip Code: 97210
Contractor: TOTAL MECHANICAL

TABLE 1 - PROJECT SEISMIC ENGINEERING PARAMETERS

Note: The following Seismic Criteria was obtained from the structural portion of the project documents. Information not provided in the project documents has been derived from the code sections or tables noted below.

Design spectral response acceleration (5% Damped) at short periods (ASCE 7-05/10, Section 11.4.4)	S_{DS} = 0.726
Component Importance Factor (ASCE 7-05/10, Section 13.1.3)	I_p = 1.50
Average Roof Height of Structure Relative to the Base Elevation	h = 91.00
Factors that vary per trade. (See Table 3 below for values)	
Component Amplification Factor (ASCE 7-05/10, Table 13.6-1)	a_p = (see table 3)
Component Response Modification Factor (ASCE 7-05/10, Table 13.6-1)	R_p = (see table 3)
Seismic Design Category (ASCE 7-05/10, Table 11.6-1)	Seismic Design Category = D

TABLE 2 - SEISMIC DESIGN FORCE EQUATIONS (FROM ASCE 7-05/10, CHAPTER 13)

F_p CALCULATION (Eq. 13.3-1)	$F_{p,max}$ - MAXIMUM LIMIT (Eq. 13.3-2)	$F_{p,min}$ - MINIMUM LIMIT (Eq. 13.3-3)
$F_p = \frac{0.4a_p \times S_{DS} \times W_p \times 0.7}{(R_p/I_p)} \times (1 + 2(z/h))$	F_p need not be greater than $1.6 \times S_{DS} \times I_p \times W_p \times 0.7$ = 1.22	F_p shall not be less than $0.3 \times S_{DS} \times I_p \times W_p \times 0.7$ = 0.23

NOTE: Values in Table 2 are multiplied by a factor of 0.7 for conversion to "Allowable Stress Design" (ASCE 7-05/10, Section 2.4.1)

TABLE 3 - SEISMIC DESIGN FORCE (F_p) PER TRADE & FLOOR

Floor # / Story	z (Ft)	High Deformability Steel or Copper Piping Welded or Brazed (NONVIB)	Limited Deformability Steel Piping w/ Threaded or Grooved Couplings (NONVIB)	High or Limited Deformability Mechanical Pipe & Plumbing (VIB)	HVAC Duct & Equipment (NONVIB)	HVAC Duct & Equipment (VIB)	Electrical Systems (Conduits & Cable Tray)	Low Deformability Piping Cast Iron, Plastic, Glass, etc
		a_p = 2.5, R_p = 9.0	a_p = 2.5, R_p = 4.5	a_p = 2.5, R_p = 2.5	a_p = 2.5, R_p = 6.0	a_p = 2.5, R_p = 2.0	a_p **= 2.5, R_p **= 6.0	a_p = 2.5, R_p = 3.0
LVL 1	13	0.23	0.23	0.39	0.23	0.49	0.23	0.33
LVL 2	26	0.23	0.27	0.48	0.23	0.60	0.23	0.40
LVL 3	39	0.23	0.31	0.57	0.24	0.71	0.24	0.47
LVL 4	52	0.23	0.36	0.65	0.27	0.82	0.27	0.54
LVL 5	65	0.23	0.41	0.74	0.31	0.93	0.31	0.62
LVL 6	78	0.23	0.46	0.83	0.34	1.03	0.34	0.69
LVL 7	91	0.25	0.51	0.91	0.38	1.14	0.38	0.76
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NOTE: Values in Table 3 are the resultant after comparing Fp with Fp.max & Fp.min.

z = Overhead Deck Elevation From Grade (ft.)
NONVIB = Non-Vibration Isolated components & systems
VIB = Vibration Isolated components & systems
** = Per ASCE 7-10 Table 13.6-1: a_p=2.5, R_p=6.0. This is more conservative than ASCE 7-05 Table 13.6-1 (a_p=1.0, R_p=2.5).

Directory - ISAT Rigid Brace Assemblies

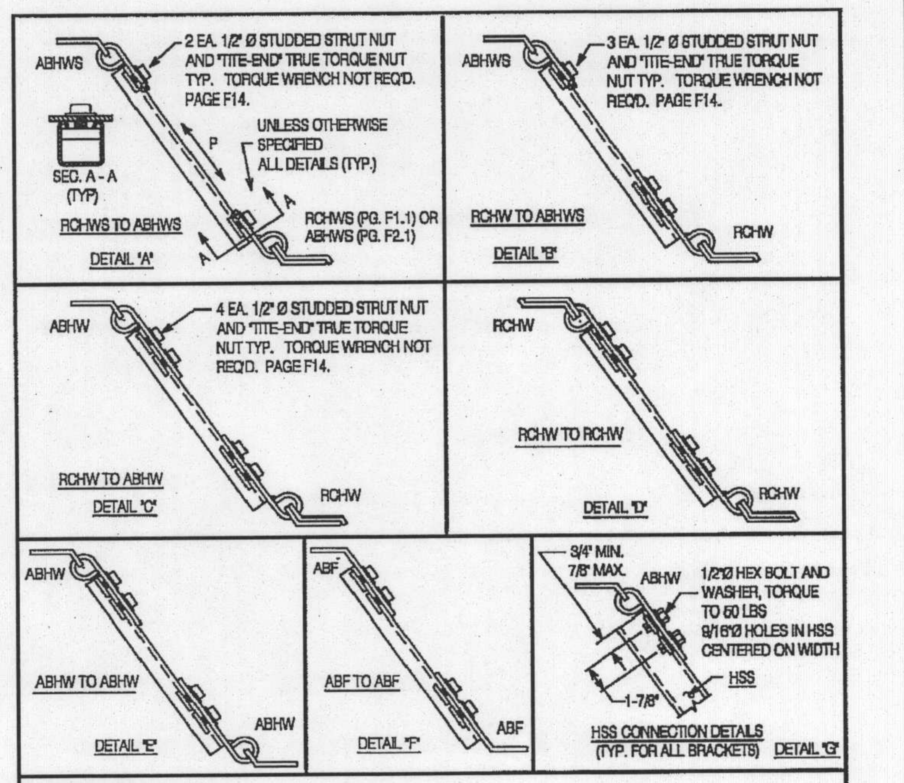
ISAT Brace Assembly [1]	Rod Diameter Inch	ISAT Seismic Brackets [2] Lower Bracket Page F__	Upper Bracket Page F__	Rigid Channel Brace Arm Page H2	Maximum Brace Arm Length [3] Ft	Brace Assembly [4] Design Value (P) Lbs	Brace Assembly Detail Page E2.__
RB1	3/8	RCHWS38	ABHWS	A1 Solid	5	750 lbs.	A
RB2	3/8	RCHWS38	ABHWS	B1 Slotted	8.5	950 lbs.	A
RB3	3/8	RCHWS38	ABHWS	B1 Solid	9	950 lbs.	A
RB4	3/8	RCHWS38	ABHWS	B2 Slotted	10	950 lbs.	A
RB5	3/8	RCHWS38	ABHWS	B2 Solid	15	950 lbs.	A
RB10	1/2	RCHWS12	ABHWS	B1 Slotted	8.5	950 lbs.	A
RB11	1/2	RCHWS12	ABHWS	B1 Solid	9	950 lbs.	A
RB12	1/2	RCHWS12	ABHWS	B2 Slotted	10	950 lbs.	A
RB12.1	1/2	RCHWS12	ABHWS	B2 Solid	15	950 lbs.	A
RB13	1/2	RCHWX12	ABHW	B2 Slotted	10	1,860 lbs.	C
RB14	1/2	RCHWX12	RCHWX12	B2 Slotted	9.5	2,185 lbs.	D
RB15	1/2	RCHWX12	RCHWX12	B2 Solid	10	2,185 lbs.	D
RB20	5/8	RCHW58	ABHWS	B1 Slotted	8.5	950 lbs.	B
RB21	5/8	RCHW58	ABHWS	B1 Solid	9	1,070 lbs	B
RB22	5/8	RCHW58	ABHWS	B2 Slotted	10	1,500 lbs	B
RB23	5/8	RCHW58	ABHW	B2 Slotted	10	1,860 lbs	C
RB24	5/8	RCHW58	RCHW58	B2 Slotted	9.5	2,185 lbs.	D
RB25	5/8	RCHW58	RCHW58	B2 Solid	10	2,185 lbs.	D
RB30	3/4	RCHW34	ABHWS	B1 Slotted	8.5	950 lbs.	B
RB31	3/4	RCHW34	ABHWS	B1 Solid	9	1,070 lbs	B
RB32	3/4	RCHW34	ABHWS	B2 Slotted	10	1,500 lbs	B
RB33	3/4	RCHW34	ABHW	B2 Slotted	10	1,860 lbs	C
RB34	3/4	RCHW34	RCHW58	B2 Slotted	9.5	2,185 lbs.	D
RB35	3/4	RCHW34	RCHW58	B2 Solid	10	2,185 lbs.	D
RB40	7/8	RCHW78	ABHWS	B1 Slotted	8.5	950 lbs.	B
RB41	7/8	RCHW78	ABHWS	B1 Solid	9	1,070 lbs	B
RB42	7/8	RCHW78	ABHWS	B2 Slotted	10	1,500 lbs	B
RB43	7/8	RCHW78	ABHW	B2 Slotted	10	1,860 lbs	C
RB44	7/8	RCHW78	RCHW58	B2 Slotted	9.5	2,185 lbs.	D
RB45	7/8	RCHW78	RCHW58	B2 Solid	10	2,185 lbs.	D
RB50	1	RCHW100	ABHWS	B1 Slotted	8.5	950 lbs.	B
RB51	1	RCHW100	ABHWS	B1 Solid	9	1,070 lbs	B
RB52	1	RCHW100	ABHWS	B2 Slotted	10	1,500 lbs	B
RB53	1	RCHW100	ABHW	B2 Slotted	10	1,860 lbs	C
RB54	1	RCHW100	RCHW58	B2 Slotted	9.5	2,185 lbs.	D
RB55	1	RCHW100	RCHW58	B2 Solid	10	2,185 lbs.	D
RB56	1 1/4	RCHW114	ABHW	B2 Slotted	10	1,860 lbs	C
RB57	1 1/4	RCHW114	RCHW58	B2 Solid	10	2,185 lbs.	D
RB60	N/A	ABF12	ABF12	B1 Solid	9	1,070 lbs	F
RB61	N/A	ABHWS	ABHWS	B1 Solid	9	1,070 lbs	A
RB62	N/A	ABF34	ABF34	B1 Solid	9	1,070 lbs	F
RB63	N/A	ABHW	ABHW	B2 Slotted	10	1,860 lbs.	E
RB64	N/A	ABF12	ABF12	B2 Slotted	10	1,865 lbs.	F
RB65	N/A	ABF34	ABF34	B2 Solid	10	2,400 lbs.	F
RB66	N/A	ABF34	ABF34	HSS 3x3x1/4	25	3,000 lbs.	G

1. Typical Rigid Brace Arm Assembly Details, Page E2.1 and E2.2.
2. Use of Any Non ISAT Bracket Voids Engineering.
3. HSS 3x3x1/4 May Be Substituted For Any Brace Arm Where P ≤ 3,000 Lbs and Maximum Length < 25 Feet. HSS 2x2x1/8 May Be Substituted For Any Brace Arm Where P ≤ 1,250 Lbs and Maximum Length < 16 Feet. Where P ≤ 1,250 Lbs., B2 Solid Maximum Allowed Length = 15 Feet.
4. At Nominal 45 Degree Brace Angle.

ISAT
International Seismic Application Technology
14848 Northam Street, La Mirada, CA 90638
877-999-4728 (Toll Free) 714-523-0845 (fax)
www.isatsb.com

W V Jaeger (signature)
Model Law Structural Engineer
NCEES No. 20675

REV-8
12/17/2009
Page E1



FOR USE WITH PAGE E1

"TITE - END" TRUE TORQUE NUT
RIGID BRACE ASSEMBLY DETAILS

ISAT
International Seismic Application Technology
14848 E. Northam Street, La Mirada, CA 90638
877-999-4728 (Toll Free) 714-523-0845 (fax)
www.isatsb.com

W V Jaeger (signature)
Model Law Structural Engineer
NCEES No. 20675

Rev. 0
11/01/08
Page E2.1

ISAT
INTERNATIONAL SEISMIC APPLICATION TECHNOLOGY

LEGACY GOOD SAMARITAN CT 1 & 2-TOTAL MECHANICAL
ISAT SEISMIC RESTRAINT LEGEND
5/29/2013

KIT NO.	BRACED ELEMENT	MAX "G" FORCE (G's)[10]	ROD DIA.	ISAT BRACE ASSEMBLY[1]	BRACE ARM TYPE[1]	BRACE ARM SIZE[1]	MAX BRACE ARM LENGTH (FT)[2]	MAX BRACE SPACING (FT)	INSTALLATION DETAIL	ANCHORAGE NOMENCLATURE AND DETAILS	MAX BRACE REACTION (LBS)[3]
R	Max 8" Pipe	0.25	3/4"	RB30	B1 Slotted Strut	12 Ga. 1-5/8" Strut	8.5	40	B1.0	D1.1TZ3 (N13TZ3)	781
S	8" Pipe	0.25	3/4"	RB30	B1 Slotted Strut	12 Ga. 1-5/8" Strut	8.5	40	B3.2	D1.1TZ3 (N13TZ3)	781

Seismic Bracing for piping & equipment designed in accordance with 2009 IBC, Sec 1613, utilizing the ISAT Application & Design Manual: Vol 2 installation details & specifications
For Seismic Design Categories D, E, & F:
For components where Ip = 1.5: Brace all pipe greater than 1" in diameter. Brace all trapezes where the accumulative weights of the utilities is 5 lbs/lft or greater.
For components where Ip = 1.5: Brace all Equipment.
For All Seismic Design Categories:
Seismic bracing may be omitted from utilities suspended by individual hangers 12" or less in length from the top of the utility to the bottom of the structural support for the hanger and the rod hangers are detailed to avoid significant bending of the hangers and their attachments. The installer & Inspector to ensure the omission of seismic restraints will not result in damaging impact with other systems.

NOTES:
1) Refer to ISAT pages/details E1 through E4.3, and H2 for brace arm design values and descriptions.
2) B2 solid channel up to 15 ft. maximum bay be substituted for any RIGID brace arm where the max brace reaction is ≤ 1,250 lbs.
3) Max brace reaction is based on the Max "G" Force, Brace Spacing and Utility weight. Based upon a nominal 45 degree brace angle.
4) Clouded areas tagged as "ATTACHED TO STRUCTURE" or "12" RULE" are out side of ISAT's scope and are the responsibility of others.
5) Use of any non ISAT bracket voids engineering
6) If drawings are not to scale or the scale is inaccurate, contractor and inspectors to ensure the "BRACE SPACING" in this legend is not exceeded.
7) Where systems are subject to thermal expansion & contraction or vibration isolated, utilize cable bracing. Cable bracing should be installed with sufficient slack to accommodate thermal expansion & contraction or acoustical movement - per the Mechanical Engineer
8) Bracing design for trapeze systems are based on single layer racks.
9) Engineering of vertical supports is not included in this design.
10) Refer to Project Specific - Seismic Design Force (SDF) Calculation Work Sheet for Utility Specific "G" Force (Fp converted to allowable stress design)
11) Bracing of equipment is not included in this design.

I.S.A.T. 14848 Northam Street, La Mirada, CA 90638 Toll Free 877-999-4728 Fax 714-523-0845

REGISTERED PROFESSIONAL ENGINEER
82127PE
OREGON
MAY 11, 2010
GERRIT WAYNE WILSON
6/4/13
EXPIRES: 06/30/14

I. S. A. T.
International Seismic Application Technology
14325 NE AIRPORT WAY #113 PORTLAND, OR 97230
503-252-4423 (US) 503-252-4427 (fax)
www.isatsb.com

ISAT

PROJECT: **LEGACY GOOD SAMARITAN HOSPITAL CT 1 & 2**
ADDRESS: PORTLAND, OR
W.O. NO.: PIPING
ORG. ISSUE DATE: 5-30-13

PROPRIETARY STATEMENT
THESE DRAWINGS/DOCUMENTS HEREIN ATTACHED ARE THE PROPERTY OF I.S.A.T. ANY REUSE OR REPRODUCTION OF THESE DOCUMENTS WITHOUT WRITTEN PERMISSION OF I.S.A.T. IS STRICTLY FORBIDDEN. ALL RIGHTS RESERVED.

DRAWN BY: KD

	CONTRACTOR	DATE
ELECTRICAL		
SHEET METAL		
HVAC PIPING	TOTAL MECHANICAL	
PLUMBING		
SPRINKLER		
GENERAL CONTR.		

REVISION:

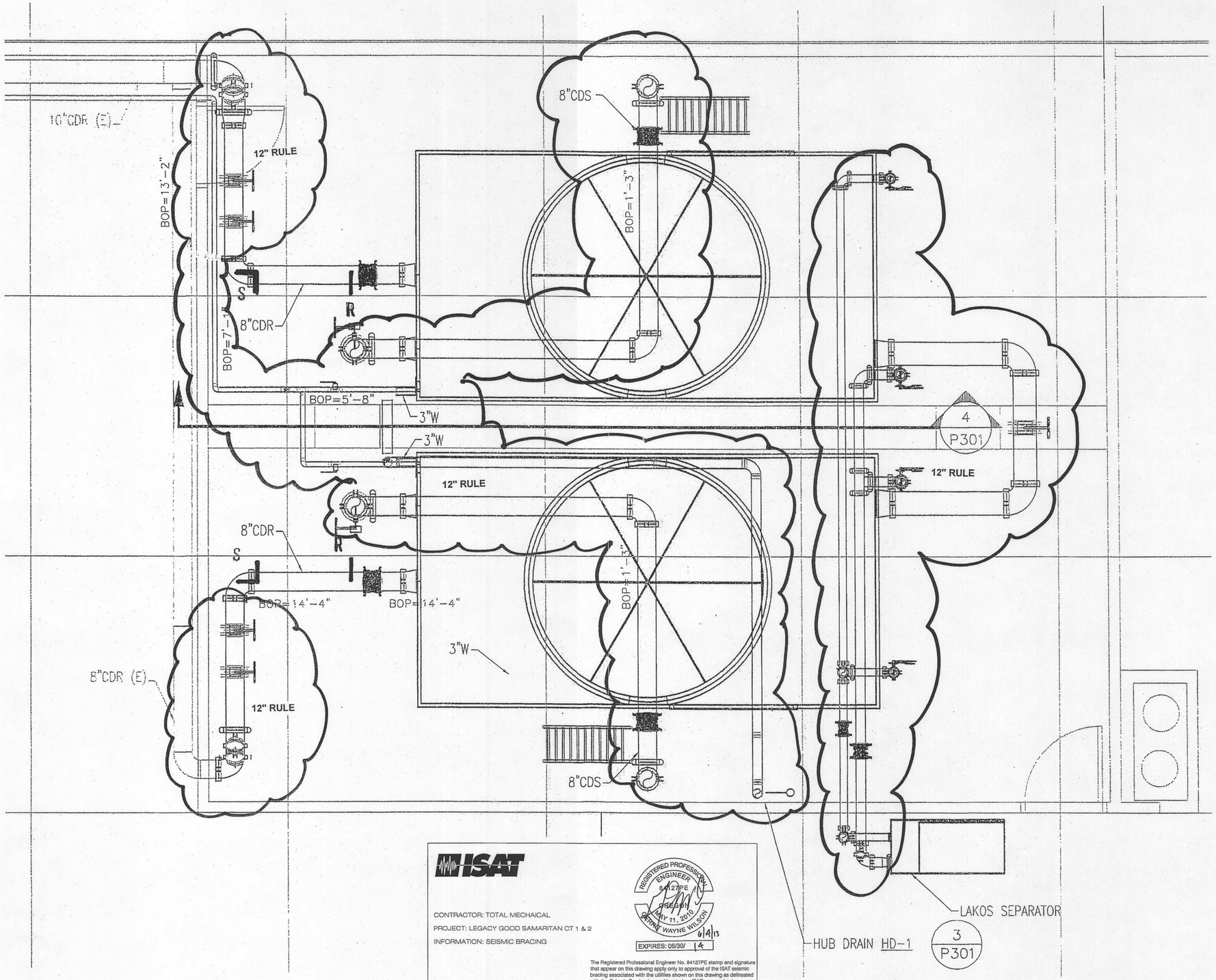
REV.	BY	ISSUE COMMENTS	DATE
△	KD	COMPLETED	5/30/13
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

SHEET TITLE: **RESTRAINT LEGEND & SDF(S)**

SCALE: **NTS**

DRAWING NO.: **SB-0.1**

REF. DRAWINGS	XREF FILES



ISAT

CONTRACTOR: TOTAL MECHAICAL

PROJECT: LEGACY GOOD SAMARITAN CT 1 & 2

INFORMATION: SEISMIC BRACING

REGISTERED PROFESSIONAL ENGINEER 84127PE OREGON MAY 11, 2010 GARTHE WAYNE WILSON

6/4/13

EXPIRES: 06/30/14

The Registered Professional Engineer No. 84127PE stamp and signature that appear on this drawing apply only to approval of the ISAT seismic bracing associated with the utilities shown on this drawing as delineated with the Seismic Bracing Legend located on ISAT's cover sheet.

SEE ISAT SEISMIC BRACING LEGEND ON SHEET # SB-0.1 FOR INFORMATION ON SEISMIC LOCATIONS & ISAT KIT I.D.

ISAT

International Seismic Application Technology
14335 NE Airport Way - Suite 101, Portland OR 97230
503-252-4423 (Office) 503-252-4427 (Fax)
www.isatsb.com
"Empowered By Experience"

PROPRIETARY STATEMENT

THESE DRAWINGS/DOCUMENTS HEREIN ATTACHED ARE THE PROPERTY OF I.S.A.T. ANY REUSE OR REPRODUCTION OF THESE DOCUMENTS WITHOUT WRITTEN PERMISSION OF I.S.A.T. IS STRICTLY FORBIDDEN. ALL RIGHTS RESERVED.

TOTAL MECHANICAL
LEGACY GOOD SAMARITAN
CT 1 & 2
PIPING

PORTLAND, OR

ISSUED FOR:	Date	
COMPLETED	6/28/13	0
		1
		2
		3
		4
		5
		6
		7
		8
		9
		10

REGISTERED PROFESSIONAL ENGINEER 84127PE OREGON MAY 11, 2010 GARTHE WAYNE WILSON

EXPIRES: 6/30/14

The Registered Professional Engineer and signature that appear on this drawing apply only to approval of the ISAT seismic bracing associated with the utilities shown on this drawing as delineated within the adjoining Seismic Bracing Legend.

Drawn By	XXX
Checked By	XXX
Project #	XXX
Date	XX/XX/XX
Scale	1/2" - 1'-0"

Sheet Title

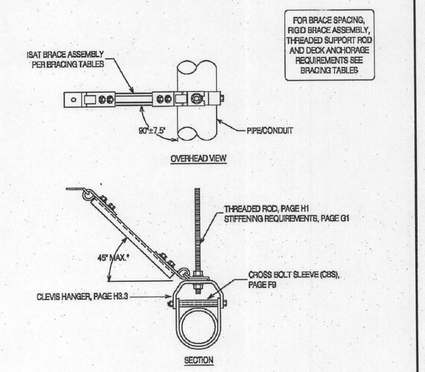
PIPING

Sheet No.

P1-0.0

Z:\Project Folders\OR\Legacy Good Sam CT 1 and 2\Plans & Details\Piping-Total

"A Company Designed To Streamline Seismic Building Code Compliance"



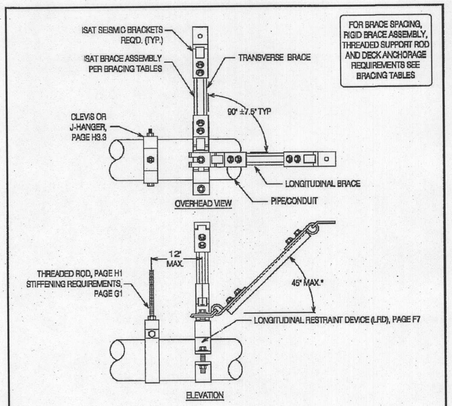
SINGLE HUNG PIPE OR CONDUIT WITH CLEVIS HANGER
1-WAY TRANSVERSE RIGID BRACE

*BRACE ANGLE TO 60° IS ALLOWED WITH REDUCED BRACE SPACING. REFER TO NOTE 20, PAGE 4.3

ISAT
International Seismic Application Technology
14848 Northam Street, La Mirada, CA 90638
877-969-4728 (Toll Free) 714-523-3645 (fax)
www.isatab.com

W V Jaugn
Model Law Structural Engineer
NCEES No. 20675

Rev. 0 11/01/08
Page B1.0



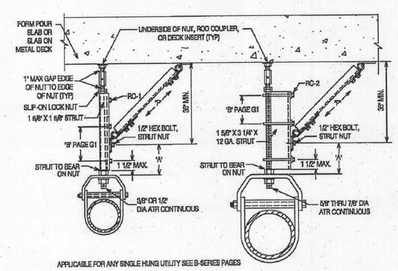
SINGLE HUNG PIPE OR CONDUIT
2-WAY TRANSVERSE-LONGITUDINAL RIGID BRACING

* BRACE ANGLE TO 60° IS ALLOWED WITH REDUCED BRACE SPACING. REFER TO NOTE 20, PAGE 4.3.

ISAT
International Seismic Application Technology
14848 Northam Street, La Mirada, CA 90638
877-969-4728 (Toll Free) 714-523-3645 (fax)
www.isatab.com

W V Jaugn
Model Law Structural Engineer
NCEES No. 20675

Rev. 3 08/02/10
Page B3.2



APPLICABLE FOR ANY SINGLE HUNG UTILITY SEE B-SERIES PAGES

Max. Dim. "A"	Maximum Brace Load "P" Per Rod Diameter (45° Max. Brace Angle From Horizontal)					
	3/8"		1/2"		5/8"	
Inch	Max. Lateral Force at Utility Lbs.	Maximum Brace Force Lbs.	Max. Lateral Force at Utility Lbs.	Maximum Brace Force Lbs.	Max. Lateral Force at Utility Lbs.	Maximum Brace Force Lbs.
4	669	1335	675	1532	1350	2121
5	769	1209	775	1248	1350	2174
8	875	1114	875	1114	1300	2145
9	400	707	425	751	1200	2121
12	325	613	325	613	1000	1885
15	225	451	225	451	800	1603
18	200	424	200	424	700	1485

SINGLE HUNG UTILITY ELEVATED BRACE ARM ATTACHMENT
MINIMUM 36 INCHES BELOW DECK

1 - WAY RIGID BRACE, TRANSVERSE OR LONGITUDINAL INSTALLATION

ISAT
International Seismic Application Technology
14848 Northam Street, La Mirada, CA 90638
877-969-4728 (Toll Free) 714-523-3645 (fax)
www.isatab.com

W V Jaugn
Model Law Structural Engineer
NCEES No. 20675

Rev. 3 11/15/09
Page B280.0

Max. Dim. "A"	Maximum Brace Load "P" Per Rod Diameter (45° Max. Brace Angle From Horizontal)					
	3/8"		1/2"		5/8"	
Inch	Max. Lateral Force at Utility Lbs.	Maximum Brace Force Lbs.	Max. Lateral Force at Utility Lbs.	Maximum Brace Force Lbs.	Max. Lateral Force at Utility Lbs.	Maximum Brace Force Lbs.
4	650	1335	675	1532	1350	2121
5	750	1209	775	1248	1350	2174
6	875	1114	875	1114	1300	2145
9	400	707	425	751	1200	2121
12	325	613	325	613	1000	1885
15	225	451	225	451	800	1603
18	200	424	200	424	700	1485

TABLE 1
DESIGN VALUES FOR ELEVATED BRACE ARM ATTACHMENT
MINIMUM 36 INCHES BELOW DECK

PAGE B290.0 FOR 1 - WAY RIGID BRACE, TRANSVERSE OR LONGITUDINAL INSTALLATION
PAGE B291.0 FOR 2 - WAY RIGID BRACE, TRANSVERSE OR LONGITUDINAL INSTALLATION
PAGE B292.0 FOR 2 - CABLE BRACE, TRANSVERSE OR LONGITUDINAL INSTALLATION

Max. Dim. "A"	Maximum Brace Load "P" Per Rod Diameter (45° Max. Brace Angle From Horizontal)					
	3/8"		1/2"		5/8"	
Inch	Max. Lateral Force at Utility Lbs.	Maximum Brace Force Lbs.	Max. Lateral Force at Utility Lbs.	Maximum Brace Force Lbs.	Max. Lateral Force at Utility Lbs.	Maximum Brace Force Lbs.
4	400	764	900	1697	1100	2074
5	300	661	700	1402	1000	2003
6	275	693	600	1273	950	2015
9	200	495	400	990	850	2103

TABLE 2
DESIGN VALUES FOR ELEVATED BRACE ARM ATTACHMENT
MAXIMUM 36 INCHES TO MINIMUM 12 INCHES BELOW DECK

PAGE B290.0 FOR 1 - WAY RIGID BRACE, TRANSVERSE OR LONGITUDINAL INSTALLATION
PAGE B291.0 FOR 2 - WAY RIGID BRACE, TRANSVERSE OR LONGITUDINAL INSTALLATION
PAGE B292.0 FOR 2 - CABLE BRACE, TRANSVERSE OR LONGITUDINAL INSTALLATION

ISAT
International Seismic Application Technology
14848 Northam Street, La Mirada, CA 90638
877-969-4728 (Toll Free) 714-523-3645 (fax)
www.isatab.com

W V Jaugn
Model Law Structural Engineer
NCEES No. 20675

Rev. 0 11/15/09
Page B293.0

REGISTERED PROFESSIONAL ENGINEER
STATE OF OREGON
MAY 11, 2010
GERRIT WAYNE WILSON
6/4/13
EXPIRES: 06/30/ 14

I. S. A. T.
International Seismic Application Technology
14325 NE AIRPORT WAY #113 PORTLAND, OR 97230
503-252-4423 (US) 503-252-4427 (fax)
www.isatab.com

ISAT

PROJECT: **LEGACY GOOD SAMARITAN HOSPITAL CT 1 & 2**

ADDRESS: PORTLAND, OR
W.O. NO.: PIPING
ORG. ISSUE DATE: 5-30-13

PROPRIETARY STATEMENT
THESE DRAWINGS/DOCUMENTS HEREIN ATTACHED ARE THE PROPERTY OF I.S.A.T. ANY REUSE OR REPRODUCTION OF THESE DOCUMENTS WITHOUT WRITTEN PERMISSION OF I.S.A.T. IS STRICTLY FORBIDDEN.
ALL RIGHTS RESERVED.

DRAWN BY: KD

CONTRACTOR: TOTAL MECHANICAL
ELECTRICAL | SHEET METAL | HVAC PIPING | PLUMBING | SPRINKLER | GENERAL CONTR.
DATE

REVISION:

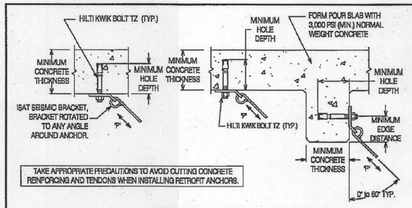
REV	BY	ISSUE COMMENTS	DATE
1	KD	COMPLETED	6/30/13
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

SHEET TITLE: **INSTALLATION DETAILS (B-DETAILS)**

SCALE: NTS

DRAWING NO.: **SBX-2.1**

REF. DRAWINGS	XREF FILES



TAKE APPROPRIATE PRECAUTIONS TO AVOID CUTTING CONCRETE REINFORCING AND TENDONS WHEN INSTALLING RETROFIT ANCHORS.

SINGLE ANCHOR CONNECTION DETAILS
Form Pour Slab with Minimum Concrete Strength of 3,000 psi

2006 IBC, 2009 IBC OR 2007 CBC PROJECTS
Anchorage in Cracked Concrete
Hilti Kwik Bolt TZ Concrete Expansion Anchor
ICC Report No. ESR-1917 (Dated Sep. 1, 2009), Table 3
Special Inspection Required by Manufacturer's ICC Report

Brace Anchorage Designation	Anchor Dia. Inch	Minimum Hole Depth [1] Inch	Minimum Effective Embedment [2] Inch	Minimum Concrete Thickness Inch	Installation Torque Ft-Lbs.	Minimum Anchor Spacing Inch	Edge Distance for Pmax Inch	Maximum Brace Load Pmax Lbs	Min. Edge Dist. Inch	Brace Load (P) at Minimum Edge Distance Lbs.
N5TZ3	3/8	2 5/8	2	4	25	8	6	555	3	410
N6TZ3	1/2	2 5/8	2	4	40	6	8	620	3	440
N13TZ3	1/2	4	3 1/4	8	40	9 3/4	12	1,330	5	950
N14TZ3	5/8	3 7/8	3 1/8	5	60	9 3/8	24	1,460	4 3/4	900
N19TZ3	5/8	4 3/4	4	6	60	12	18	1,960	6	1,200

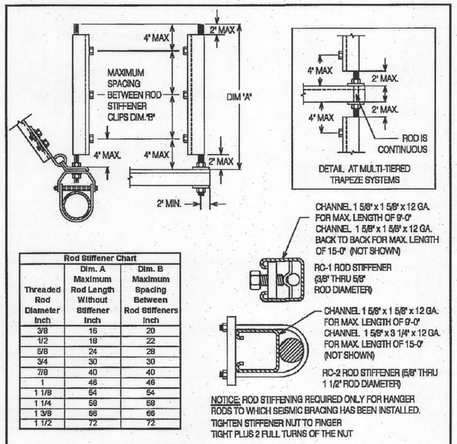
1. MINIMUM HOLE DEPTH IS TO BE VERIFIED BY THE INSPEC
2. MINIMUM EFFECTIVE EMBEDMENT IS AFTER THE ANCHOR HAS BEEN
3. ANCHOR SPACING IS THE CENTER-TO-CENTER DISTANCE BETWEEN TWO ANCHORS. THE DISTANCE TO AN ADJACENT ANCHOR IS THREE TIMES THE TABULATED EDGE DISTANCE.
4. AT CONCRETE CORNERS USE THE TABULATED VALUE FOR "EDGE DISTANCE FOR PMAX" FOR ONE EDGE WHERE THE "MIN. EDGE DISTANCE" IS USED FOR THE PERPENDICULAR CONCRETE FACE.

SINGLE ANCHOR HILTI KWIK BOLT TZ FOR SEISMIC BRACE CONNECTION IN FORM POUR SLAB

International Seismic Application Technology
14848 Northam Street, La Mirada, CA 90638
877-969-4728 (Toll Free) 714-523-0845 (fax)
www.isatsb.com

W V Jaeger
Model Law Structural Engineer
NCEES No. 20675

Rev. 3 07/27/10
Page D1.1TZ3



Rod Stiffener Chart		
Threaded Rod Diameter Inch	Dim. A Maximum Rod Length Without Stiffener Inch	Dim. B Maximum Spacing Between Rod Stiffeners Inch
3/8	16	20
1/2	18	22
5/8	24	28
3/4	30	30
7/8	40	40
1	46	46
1 1/8	54	54
1 1/4	58	58
1 3/8	66	66
1 1/2	72	72

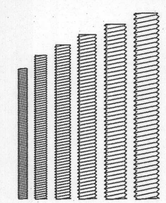
NOTICE: ROD STIFFENING REQUIRED ONLY FOR HANGER RODS TO WHICH SEISMIC BRACING HAS BEEN INSTALLED.
TIGHTEN STIFFENER NUT TO FINGER TIGHT PLUS 2 FULL TURNS OF THE NUT

ROD STIFFENING REQUIREMENTS

International Seismic Application Technology
14848 E. Northam Street, La Mirada, CA 90638
877-969-4728 (Toll Free) 714-523-0845 (fax)
www.isatsb.com

W V Jaeger
Model Law Structural Engineer
NCEES No. 20675

Rev. 0 11/01/06
Page G1



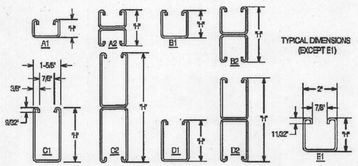
Rod Diameter Inch	Min. ASTM A36 Steel: High Temperature Applications Maximum Tension Design Value Lbs	Building Services Piping Maximum Tension Design Value Lbs
3/8	610	790
1/2	1,130	1,460
5/8	1,810	2,340
3/4	2,710	3,500
7/8	3,770	4,860
1	4,960	6,400
1-1/8	6,230	8,000
1-1/4	8,000	10,300
1-3/8	-	12,180
1-1/2	-	14,560
1-3/8	-	20,180
2	-	26,680
	ASME B31.1 Rod Temp of 650 Deg.	ASME B31.9

ALL-THREAD ROD FOR VERTICAL SUPPORTS

International Seismic Application Technology
14848 Northam Street, La Mirada, CA 90638
877-969-4728 (Toll Free) 714-523-0845 (fax)
www.isatsb.com

W V Jaeger
Model Law Structural Engineer
NCEES No. 20675

Rev. 0 11/01/06
Page H1



Channel	Steel Gage	Height "H" Inch	Area Of Section Inch²	MINIMUM ELEMENTS OF SECTION (For Solid) X-X AXIS: Moment of Inertia Inch⁴	X-X AXIS: Section Modulus Inch³	X-X AXIS: Radius of Gyration Inch	Y-Y AXIS: Moment of Inertia Inch⁴	Y-Y AXIS: Section Modulus Inch³	Y-Y AXIS: Radius of Gyration Inch
A1	12	13/16	0.371	0.030	0.061	0.294	0.115	0.142	0.554
A2	12	1 5/8	0.742	0.136	0.188	0.428	0.230	0.284	0.564
B1	12	1 5/8	0.565	0.185	0.202	0.577	0.236	0.290	0.651
B2	12	3 1/4	1.111	0.628	0.571	0.914	0.471	0.580	0.651
C1	12	3 1/4	0.897	1.098	0.627	1.107	0.433	0.533	0.695
C2	12	6 1/2	1.793	6.227	1.916	1.864	0.866	1.066	0.695
D1	12	2 7/16	0.726	0.522	0.390	0.848	0.334	0.411	0.679
D2	12	4 7/8	1.452	2.865	1.151	1.380	0.669	0.823	0.679
E1	10	2	0.812	0.478	0.438	0.723	0.569	0.569	0.790

1. QUALIFIED BRANDS MEETING OR EXCEEDING ABOVE VALUES MAY BE USED SUBJECT TO ISAT REVIEW AND APPROVAL FROM ENGINEER-OF-RECORD.
2. BEAM LOAD MAY BE LIMITED BY SPOT WELD SHEAR. REFER TO CHANNEL MANUFACTURERS TECHNICAL DATA.
3. A2, B2, C2 AND D2 - FACTORY SPOT WELDED BACK-TO-BACK CHANNEL. SUPPLEMENTAL SWITCH WELD NOT REQUIRED.
4. STRUT WITH HOLES HAVE SECTION PROPERTIES REDUCED BY 0.90. STRUT WITH SLOTS HAVE SECTION REDUCED BY 0.85.

CHANNEL PROFILE, DESIGNATIONS AND SECTION VALUES, ASTM A653 GRADE 33

International Seismic Application Technology
14848 Northam Street, La Mirada, CA 90638
877-969-4728 (Toll Free) 714-523-0845 (fax)
www.isatsb.com

W V Jaeger
Model Law Structural Engineer
NCEES No. 20675

Rev. 2 10/01/06
Page H2

REGISTERED PROFESSIONAL ENGINEER
OREGON
MAY 11, 2010
GERRIT WAYNE WILSON
EXPIRES: 06/30/ 14
6/4/13

I. S. A. T.
International Seismic Application Technology
14325 NE AIRPORT WAY #113 PORTLAND, OR 97230
503-252-4423 (US) 503-252-4427 (fax)
www.isatsb.com

PROJECT: **LEGACY GOOD SAMARITAN HOSPITAL CT 1 & 2**
ADDRESS: PORTLAND, OR
W.O. NO.: PIPING
ORG. ISSUE DATE: 5-30-13

PROPRIETARY STATEMENT
THESE DRAWINGS/DOCUMENTS HEREIN ATTACHED ARE THE PROPERTY OF I.S.A.T. ANY REUSE OR REPRODUCTION OF THESE DOCUMENTS WITHOUT WRITTEN PERMISSION OF I.S.A.T. IS STRICTLY FORBIDDEN. ALL RIGHTS RESERVED.

DRAWN BY: KD

DISTRIBUTION: ELECTRICAL, SHEET METAL, HVAC TYPING, PLUMBING, SPRINKLER, GENERAL CONTL. — TOTAL MECHANICAL — ISSUE

REVISION:

REV.	BY	ISSUE COMMENTS	DATE
1	KD	COMPLETED	5/30/13
2			
3			
4			
5			
6			
7			
8			
9			
10			

SHEET TITLE: **BRACE ARM ANCHORAGE DETAILS (D-DETAILS)**

SCALE: NTS

DRAWING NO.: **SB-2.1**

REF. DRAWINGS	XREF FILES