Project
Job No.
By AL
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North Bay Seismic Design
Structural Analysis and Design
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ANALYSIS AND DESIGN - BUILDING STRUCTURES
PARTIAL LIST OF PROPRIETARY PARAMETRIC SOFTWARE TOOLS
NBSD STRUCTURAL ANALYSIS AND DESIGN REFERENCE TOOL LIBRARY

1. NBSD Software Tools - Building Structures

Material	Task	NBSD Software Tool	Code References	Reference Problem/ Description
All	Vertical Loads	**Gravity Loading (ASCE 7-05 Loading)**		
		Gravity Loading		
		Reduction in Roof and Floor Live Loads	ASCE 7-05 Section 4.8, 4.9	"Structural Load Determination Under 2006 IBC and ASCE 7-05" - Example 3.4.1
		Rain Loading on Un-deflected Roof	IBC 09 Section 1611	" Example 3.4.4
		Snow Loading		
		Snow Loading on Hip or Gable Roofs	ASCE 7-05 Section 7.4 - 7.10	"Structural Load Determination Under 2006 IBC and ASCE 7-05" - Examples 4.1, 4.2
		Snow Drift on Lower Roofs or Adjacent Buildings	"	" Example 4.3
		Snow Drift on Roof Projections	ASCE 7-05 Section 7.8	" Example 4.4
All	Lateral Loads	**Lateral Loading (ASCE 7-05 Loading)**		
		Wind Loading		
		Main Wind Force Resisting Systems - **Method 1** (Low Rise Buildings - Walls and Roof)	ASCE 7-05 Section 6.4.1.1	"Structural Load Determination Under 2006 IBC and ASCE 7-05" - Example 5.1
		Components and Cladding - **Method 1** (Low Rise Buildings - Walls and Roof)	" Section 6.4.1.2	"
		Main Wind Force Resisting Systems - **Method 2** (Low Rise Buildings Under 60 feet - Walls and Roof)	" Section 6.5.12.2.2	" Example 5.2
		Components and Cladding - **Method 2** (Low Rise Buildings Under 60 feet - Walls)	" Section 6.5.12.4	"
		(Low Rise Buildings Under 60 feet - Gable or Hip Roofs)	" Section 6.5.12.2.2	
		(Low Rise Buildings Under 60 feet - Monoslope Roofs)	"	
		Main Wind Force Resisting Systems - **Method 2** (No Height Limit - Walls and Roof)	" Section 6.5.12.2.1	" Example 5.3
		Components and Cladding - **Method 2** (No Height Limit - Walls and Roof)	" Section 6.5.12.4	"
		Earthquake Loading		
		Determination of Seismic Design Category, S_{DS}, S_{D1}	ASCE 7-05 Section 11.4	"Structural Load Determination Under 2006 IBC and ASCE 7-05" - Example 6.1
		Simplified Procedure for Simple Bearing Wall System	" Section 12.14	
		Base Shear, Vertical Force Distribution of Seismic Forces, Diaphragm Forces	" Section 12.18.1.1, 12.8.3, 12.10.1.1	" Example 6.4
		Determination of Horizontal Structural Irregularities (Torsional, Re-entrant Corner, Diaphragm Discontinuity Irregularity Checks)	" Table 12.3-1	" Example 6.2, 6.4

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Material	Task	NBSD Software Tool	Code References	Reference Problem/ Description
All	**Lateral Loads**	Determination of Vertital Structural Irregularities (Stiffness, Weight or Mass, Vertical Geometric, Weak Story Irregularity Checks)	" Table 12.3-2	" Example 6.2, 6.4
		Permitted Analytical Procedures (Acording to Seismic Design Category and Building configuration)	" Tables 12.3-1 and 12.3-2	" Example 6.2
		Story Drifts Checks	" Section 12.8.6, Table 12.12-1	" Example 6.4
		P-Delta Effects Check	" Section 12.8.7	" Example 6.6
		Sesmic Demands on Non-structural Components (Building Parapet, etc)	" Section 13.3	" Example 6.6
Steel	Analysis Tools	Approximate (Fast) Analysis of Braced Frames Diagonal Braced Frame Chevron Braced Frame X Braced Frame	Determines Stiffness, Deflection, and Forces to members of 1-story frame systems.	
		SAP2000 Pre and Post Processor for AISC 2-D Steel Frame Systems Description: - Concentric/Eccentric Braced Frame configurations w/ relevant nodal response constraints; - Max 10 columns x 25 stories - Beam Tributary Trapezoidal Gravity Load distribution (DL, LL) - ASCE 7-05 Static (ELF) or Dynamic (ARS) Analysis - ASCE 7-05 Load Combinations		Input Data by user is plotted on spreadsheet and used to create a **SAP2000** analytical model input file, which is imported from within the program and run; results for all nodes and elements are then extracted from program to be effectively displayed in tabular form and plotted on a Results spreadsheet (also showing relevant Input Data).
	Design Tools	**Ordinary Concentric Braced Frame Systems (OCBF)**		
		OCBF Brace Design - HSS	AISC 341-05 Section 14	AISC 341-05 Example 3.1
		OCBF Column Design	"	" Example 3.2
		OCBF Beam Design	"	" Example 3.3
		OCBF Brace-to-Beam/Column Connection Dessign - Welded	"	" Example 3.4
		Special Concentric Braced Frame Systems (SCBF)		
		SCBF Brace Design - Pipe	AISC 341-05 Section 13	AISC 341-05 Example 3.6
		SCBF Brace Design - W Shape	"	" Example 3.7
		SCBF Column Design	"	" Example 3.8
		SCBF Beam Design - Inverted V	"	" Example 3.9
		SCBF Brace-to-Beam Connection Design - Welded	"	" Example 3.10
		SCBF Brace-to-Beam/Column Connection Design - Welded	"	" Example 3.11
		Eccentric Braced Frame Systems (EBF)		
		EBF Link Design	AISC 341-05 Section 15	AISC 341-05 Example 3.14
		EBF Beam Outside of the Link Design	"	" Example 3.15
		EBF Brace Design	"	" Example 3.16
		EBF Column Design	"	" Example 3.17
		EBF Brace-to-Link Design	"	" Example 3.18
		EBF Brace-to-Beam/Column Design	"	" Example 3.19

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Steel		**Special Moment Frame Systems (SMF)**		
		Story Drift and Stability Check	AISC 341-05 Section 9	AISC 341-05 Example 4.8
		SMF Column Design	"	" Example 4.9
		SMF Beam Design	"	" Example 4.10
		SMF Beam-Column Connection Design	"	" Example 4.11
		Gravity Column Splice Design in MR Frame	"	" Example 4.12
		SMF Column Splice Design	"	" Example 4.13
		Other Systems Using R > 3		
		Diaphragm Chord and Collector Design	AISC 341-05, 360-05	AISC 341-05 Example 5.1
		Collector Connection Design	"	" Example 5.2
		Miscellaneous Steel Design Tools		
		Column Base Plate - AISC Steel Design Series Guide 1		
		Column Base Plate - w/ Small Moment	AISC 360-05	
		Column Base Plate - w/ Large Moment	"	
Concrete	Analysis Tools	Determination of Perforated Shear Wall Stiffness		Alan Williams SE Review Prob 1989 A-4, 1884 A-6
		Rigid Diaphragm Lateral and Torsional Loading to Walls		Alan Williams SE Review Prob 1989 A-4, 1887 A-4
		SAP2000 Pre and Post Processors for 2-D Concrete Frame/Shear Wall Systems Description: - Moment Resisting frame element / Shear Wall configurations w/ concrete cracking effects - Max 10 columns x 25 stories - Beam Tributary Trapezoidal Gravity Load distribution (DL, LL) - ASCE 7-05 Static (ELF) or Dynamic (ARS) Analysis - ASCE 7-05 Load Combinations		Input Data by user is plotted on spreadsheet and used to create a **SAP2000** analytical model input file, which is imported from within the program and run; results for all nodes and elements are then extracted from program to be effectively displayed in tabular form and plotted on a Results spreadsheet (also showing relevant Input Data).
	Design Tools	**RC Special Moment Resisting Frame**		
		Proportioning and Detailing of SMF Beams	ACI 318-08 Section 21.5	PCA Notes on ACI 318-05 Example 29.2
		Proportioning and Detailing of SMF Columns	ACI 318-08 Section 21.6	" Example 29.3
		Proportioning and Detailing of Exterior Beam-Column Connection	ACI 318-08 Section 21.7	" Example 29.4
		Proportioning and Detailing of Interior Beam-Column Connection	"	" Example 29.5
		RC Shear Wall Design		
		Proportioning and Detailing of Shear Walls W/O Boundary Elements	ACI 318-08 Section 11.10, 21.9	PCA Notes on ACI 318-05 Example 21.4
		Proportioning and Detailing of Shear Walls W/ Boundary Elements	ACI 318-08 Section 21.9	" Example 29.6
		RC Strong Connections for Precast RC Frame - ACI 318-08		
		Proportioning and Detailing of Strong Connections :	ACI 318-08 Section 21.8	PCA Notes on ACI 318-05 Example 29.7
		Beam-to-Beam Connection	"	"
		Column-to-Column Connection	"	"
		Beam-Column Connection	"	"

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Material	Task	NBSD Software Tool	Code References	Reference Problem/ Description
Concrete		**Design of Slab Column Connections**		
		Seismic Design of Slab-Column Connections	ACI 318-08 Section 11.12, 21.11	PCA Notes on ACI 318-05 Example 29.8
		Miscellaneous Concrete Design Tools		
		Reinfoced Concrete Capacity Evaluation :		
		RC Section Flexural Capacity		Numerous projects
		RC Section Flexural Capacity - Working Stress		"
		RC Section Shear Capacity		"
		RC Corbel Seat Support Design	ACI 318-08 Section 11.8	Alan Williams SE Review Prob 1990 C-1
		Concrete Stair Platform Design		
		Foundations		
		Single Spread Footing - Without Flexure	ACI 318-08 Sections 10.2, 10.14, 11.2, 11.4, 11.10, 11.11, 12.2, 15.4	Alan Williams SE Review Prob 1991 C-3
		Single Spread Footing - With Eccentric Loading	ACI 318-08 Sections 11.2, 11.4, 11.10, 11.11, 11.14,12.2, 15.4	"
		Continuous Spread Footing (Stem Wall) Design	ACI 318-08 Sections 10.2, 11.4, 11.5, 17.6	Alan Williams SE Review Prob 1988 C-2
		Mat Foundation Design	ACI 318-08 Sections 10.2, 10.5, 11.1, 11.2, 11.4, 11.10, 11.11, 11.14,12.2, 15.4	Alan Williams SE Review Prob 1988 C-3
		Note: Piled Foundation w/ Eccentric loading provided in Bridge foundation tools.		
Timber	Analysis Tools	Miscellaneous Analysis Tools		
		Timber Simple Span Loads and Deflection Checks		Misc projects
		Multi-Story Shear Wall - Vertical Distribution of Shear Forces		"
		Multi-Story Shear Wall - Vertical Distribution of Axial Forces		"
	Design Tools	Miscellaneous Design Tools		
		Design of Members in Compression	NDS 2005	Misc projects
		Design of Members in Flexure	"	"
		Design of Members Subjected to Combined Flexure and Axial Loads	"	"
		Out-of-Plane Wall Anchorage	ASCE 12.11	"