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Modeling, Analysis & Design of RC Building Using ETABS (Metric Units) ACECOMS, AIT Table of Content Objective 5 Problem 5 Step by Step 12 1. Start Model with Template 12 2. Define Material Properties 14 3. Define Member Sections 15 4. Draw the Members 20 5. Define Load Cases and Assign Loads 50 6. Define Mass Source 61 7. Define the Design Codes 62 8. Assign Rigid Diaphragm and Mesh the Frame 64 9. Add Load Combinations 66 10. Set Analysis Options 68 11. Run Analysis 69 12. Run Concrete Frame Design and View the Results 70 13. Run Shear Wall Design and View the Results 75 14. Check Story Drift 82 ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 5/83 Objective To demonstrate and practice step-by-step on the modeling, analysis and design of 10 story RC building by static lateral force procedure. Problem Carry out analysis, and design of 10 story RC building as shown in following details using UBC-97 static lateral force procedure. 3D View ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 6/83 Plan View (Unit in m) BASE STORY 4 STORY 5 STORY 8 ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 7/83 STORY 9 STORY 10 Elevation View ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 8/83 Elevation View of Elevator Shaft ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 9/83 Material Properties for Concrete (Unit in kg and cm) Section Properties Member Dimension Beam B1 (width x height) 30 x 60 cm Beam B2 (width x height) 40 x 80 cm Column C1 40 x 40 cm Column C2 50 x 50 cm Slab Thickness = 15 cm Shear wall Thickness = 20 cm ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 10/83 Story Height Data Story Height Typical Story 3.00 m Static Load Cases Load Name Load Type Details Value Self Weight of Structural MembersCalculate automatically using Self Weight Multiplier in ETABS - DEAD Dead Load Uniform Load on Slabs: (Finishing + Partition Load) 0.20 t/m2 LIVE Reducible Live Load Uniform Load on Slabs: (Use Tributary Area: UBC97) 0.25 t/m2 Wind Load Cases (UBC97) Load Case Parameter WINDX WINDY Wind Direction X Y Wind Speed 70 mph Exposure Type B (Suburban area) Importance Factor 1 (Building normal importance) ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 11/83 Static Lateral Force Parameters (UBC-97) Parameter Values Remark Seismic Zone 2A Seismic Zone Factor 0.15 Table 16-I (UBC-97) Soil Profile Type SD Overstrength Factor 6.5 Dual Systems Concrete Shear Walls with Concrete IMRF Table 16-N (UBC-97) Importance Factor 1 Table 16-K (UBC-97) Ct 0.02 Section 1630.2.2 (UBC-97) Eccentricity Ratio 0.05 Section 1630.6 (UBC-97) Static Lateral Force Case Load Case Name Direction and Eccentricity % Eccentricity EQX X Dir + Eccen. Y 0.05 EQNX X Dir - Eccen. Y 0.05 EQY Y Dir + Eccen. X 0.05 EQNY Y Dir - Eccen. X 0.05 ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 12/83 Step by Step 1. Start Model with Template Step 1-1: Select Working Unit and Start New Model using Template Start up screen of ETABS, select working unit to be ton-m at drop-down menu on the bottom-right of screen and click on New Model button to start new model using template Note: Click the Default.edb button. This means that the definitions and preferences will be initialized (get their initial values) from the Default.edb file that is in the same directory as your ETABS.exe file. If the Default.edb file does not exist in this directory then the definitions and preferences are initialized using ETABS built-in defaults. You should create your Default.edb file such that you most commonly click this button. In some cases you may want to click the Choose.edb button and specify a different file from which the definitions and preferences are to be initialized. For example, a certain client or project may require certain things in your model to be done in a certain way that is different from your typical office standards. You could have a specific .edb file set up for this client or project which could then be used to initialize all models for the client or project. This will allow setting of the repeatedly used preferences. Click the No button if you just want to use the built-in ETABS defaults. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 13/83 Step 1-2: Specify Grid and Story Dimension Specify grid dimension and story dimension as shown in figure below. Select Grid Only option to add the structural objects later. Step 1-3: Save the Model The grid system has been created as parameters specified from previous steps. Go to File >> Save, and save the file. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 14/83 2. Define Material Properties Step 2-1: Change Working Unit Change working unit to kg-cm and go to Define >> Material. Click Add New Material button to add the new concrete material. Note: You may select N-mm or Kip-in or whatever unit to input material properties. Step 2-2: Specify the Material Properties Specify material properties of concrete (fc = 240 ksc) as shown in the figure below. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 15/83 3. Define Member Sections Step 3-1: Define Frame Section for Beam (30 cm x 60 cm) Go to Define >> Frame Sections and select on Add Rectangular from second drop-down menu. Enter beam section properties for B1 as shown in figure below. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 16/83 Step 3-2: Define Frame Section for Beam (40 cm x 80 cm) Select on Add Rectangular from second drop-down menu. Enter beam section properties for B2 as shown in figure below. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 17/83 Step 3-3: Define Frame Section for Column (40 cm x 40 cm) Select on Add Rectangular from second drop-down menu. Enter column section properties for C1 as shown in figure below. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 18/83 Step 3-4: Define Frame Section for Column (50 cm x 50 cm) Select on Add Rectangular from second drop-down menu. Enter column section properties for C2 as shown in figure below. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 19/83 Step 3-5: Define Area Section for Slab (15 cm thk.) Go to Define >> Wall/Slab/Deck Sections and select on Add New Slab from drop-down menu. Enter slab section properties as shown in figure below. Step 3-6: Define Area Section for Wall (20 cm thk.) Select on Add New Wall from drop-down menu. Enter wall section properties as shown in figure below. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 20/83 4. Draw the Members Step 4-1: Change View to Plan View and Change Working Unit to Ton-m Activate left window by clicking on left window area, click on Set Plan View button and select STORY1. Change working unit to Ton-m Step 4-2: Draw Columns at Story 1 Click on button, select the property of column in Properties of Object dialogue. Window the grid intersections from Grid A4 to H1. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 21/83 Step 4-3: Draw Beams at Story 1 Click on button, select the property of beam in Properties of Object dialogue. Window the grid intersections from Grid A4 to H1. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 22/83 Step 4-4: Draw Slabs at Story 1 Click on button, select the property of slab in Properties of Object dialogue. Window the grid intersections from Grid A4 to H1. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 23/83 Step 4-5: Set Building View Options Click on button, set the building as shown in the figure below. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 24/83 Step 4-6: Assign the Beam Section (B2) Select the beams along Y-direction. Go to Assign >> Frame/Line >> Frame Section, and assign B40x80 section as shown in the figure below. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 25/83 Step 4-7: Mesh the Slabs Select all the slabs and go to Edit >> Mesh Areas. Enter the number of meshes as shown in the figure below. ETABS Tutorial Example ACECOMS, AIT Modeling, Analysis & Design of RC Building 26/83 Step 4-8: Draw the Wall Click on Rubber Band Zoo You're Reading a Free Preview Pages 7 to 14 are not shown in this preview. You're Reading a Free Preview Pages 18 to 27 are not shown in this preview. ETABS is an engineering software product that caters to multi-story building analysis and design. Modeling tools and templates, code-based load prescriptions, analysis methods and solution techniques, all coordinate with the grid-like geometry unique to this class of structure. Basic or advanced systems under static or dynamic conditions may be evaluated using ETABS. For a sophisticated assessment of seismic performance, modal and direct-integration time-history analyses may couple with P-Delta and Large Displacement effects. Nonlinear links and concentrated PMM or fiber hinges may capture material nonlinearity under monotonic or hysteretic behavior. Intuitive and integrated features make applications of any complexity practical to implement. Interoperability with a series of design and documentation platforms makes ETABS a coordinated and productive tool for designs which range from simple 2D frames to elaborate modern high-rises. 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