|  |
| --- |
| **طرح نگهداشت و افزایش تولید 27 مخزن** |
| **ROOF STRUCTURE CALCULATION FOR FIRE WATER TANKS (TK-2301 A/B)****نگهداشت و افزایش تولید میدان نفتی بینک** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| V01 | Jan. 2025 | IFI | IDR | M.Fakharian | S.Faramarzpour |  |
| V00 | NOV. 2024 | IFI | IDR | M.Fakharian | M.Sadeghian |  |
| **Rev.** | **Date** | **Purpose of Issue/Status** | **Prepared by:** | **Checked by:** | **Approved by:** | **CLIENT Approval** |
|  |
| **Status:** | **IFA: Issued For Approval****IFI: Issued For Information****AFC: Approved For Construction**  |

**REVISION RECORD SHEET**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PAGE** | **V00** | **V01** | **V02** | **V03** | **V04** |  | **PAGE** | **V00** | **V01** | **V02** | **V03** | **V04** |
| **1** | X | X |  |  |  | **66** |  |  |  |  |  |
| **2** | X | X |  |  |  | **67** |  |  |  |  |  |
| **3** | X | X |  |  |  | **68** |  |  |  |  |  |
| **4** | X | X |  |  |  | **69** |  |  |  |  |  |
| **5** | X | X |  |  |  | **70** |  |  |  |  |  |
| **6** | X | X |  |  |  | **71** |  |  |  |  |  |
| **7** | X | X |  |  |  | **72** |  |  |  |  |  |
| **8** | X | X |  |  |  | **73** |  |  |  |  |  |
| **9** | X | X |  |  |  | **74** |  |  |  |  |  |
| **10** | X | X |  |  |  | **75** |  |  |  |  |  |
| **11** | X | X |  |  |  | **76** |  |  |  |  |  |
| **12** |  | X |  |  |  | **77** |  |  |  |  |  |
| **13** |  | X |  |  |  | **78** |  |  |  |  |  |
| **14** |  | X |  |  |  | **79** |  |  |  |  |  |
| **15** |  | X |  |  |  | **80** |  |  |  |  |  |
| **16** |  | X |  |  |  | **81** |  |  |  |  |  |
| **17** |  | X |  |  |  | **82** |  |  |  |  |  |
| **18** |  |  |  |  |  | **83** |  |  |  |  |  |
| **19** |  |  |  |  |  | **84** |  |  |  |  |  |
| **20** |  |  |  |  |  | **85** |  |  |  |  |  |
| **21** |  |  |  |  |  | **86** |  |  |  |  |  |
| **22** |  |  |  |  |  | **87** |  |  |  |  |  |
| **23** |  |  |  |  |  | **88** |  |  |  |  |  |
| **24** |  |  |  |  |  | **89** |  |  |  |  |  |
| **25** |  |  |  |  |  | **90** |  |  |  |  |  |
| **26** |  |  |  |  |  | **91** |  |  |  |  |  |
| **27** |  |  |  |  |  | **92** |  |  |  |  |  |
| **28** |  |  |  |  |  | **93** |  |  |  |  |  |
| **29** |  |  |  |  |  | **94** |  |  |  |  |  |
| **30** |  |  |  |  |  | **95** |  |  |  |  |  |
| **31** |  |  |  |  |  | **96** |  |  |  |  |  |
| **32** |  |  |  |  |  | **97** |  |  |  |  |  |
| **33** |  |  |  |  |  | **98** |  |  |  |  |  |
| **34** |  |  |  |  |  | **99** |  |  |  |  |  |
| **35** |  |  |  |  |  | **100** |  |  |  |  |  |
| **36** |  |  |  |  |  | **101** |  |  |  |  |  |
| **37** |  |  |  |  |  | **102** |  |  |  |  |  |
| **38** |  |  |  |  |  | **103** |  |  |  |  |  |
| **39** |  |  |  |  |  | **104** |  |  |  |  |  |
| **40** |  |  |  |  |  | **105** |  |  |  |  |  |
| **41** |  |  |  |  |  | **106** |  |  |  |  |  |
| **42** |  |  |  |  |  | **107** |  |  |  |  |  |
| **43** |  |  |  |  |  | **108** |  |  |  |  |  |
| **44** |  |  |  |  |  | **109** |  |  |  |  |  |
| **45** |  |  |  |  |  | **110** |  |  |  |  |  |
| **46** |  |  |  |  |  | **111** |  |  |  |  |  |
| **47** |  |  |  |  |  | **112** |  |  |  |  |  |
| **48** |  |  |  |  |  | **113** |  |  |  |  |  |
| **49** |  |  |  |  |  | **114** |  |  |  |  |  |
| **50** |  |  |  |  |  | **115** |  |  |  |  |  |
| **51** |  |  |  |  |  | **116** |  |  |  |  |  |
| **52** |  |  |  |  |  | **117** |  |  |  |  |  |
| **53** |  |  |  |  |  | **118** |  |  |  |  |  |
| **54** |  |  |  |  |  | **119** |  |  |  |  |  |
| **55** |  |  |  |  |  | **120** |  |  |  |  |  |
| **56** |  |  |  |  |  | **121** |  |  |  |  |  |
| **57** |  |  |  |  |  | **122** |  |  |  |  |  |
| **58** |  |  |  |  |  | **123** |  |  |  |  |  |
| **59** |  |  |  |  |  | **124** |  |  |  |  |  |
| **60** |  |  |  |  |  | **125** |  |  |  |  |  |
| **61** |  |  |  |  |  | **126** |  |  |  |  |  |
| **62** |  |  |  |  |  | **127** |  |  |  |  |  |
| **63** |  |  |  |  |  | **128** |  |  |  |  |  |
| **64** |  |  |  |  |  | **129** |  |  |  |  |  |
| **65** |  |  |  |  |  | **130** |  |  |  |  |  |

**CONTENTS**

[1.0 INTRODUCTION 4](#_Toc188992775)

[2.0 USING CODES: 5](#_Toc188992776)

[3.0 TRIAL SIZING: 5](#_Toc188992777)

[4.0 LOADING: 5](#_Toc188992778)

[*5.0* *STRUCTURE* *ANALYSIS:* 8](#_Toc188992779)

[*6.0* *STRUCTURE DESIGN:* 14](#_Toc188992780)

[Input Design Data: 14](#_Toc188992781)

[Out Put Design Data: 15](#_Toc188992782)

1. **INTRODUCTION**

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

**GENERAL DEFINITION**

The following terms shall be used in this document.

|  |  |
| --- | --- |
| CLIENT:  | National Iranian South Oilfields Company (NISOC)  |
| PROJECT: | Binak Oilfield Development – SUPPLY STORAGE TANK |
| EPD/EPC CONTRACTOR (GC):  | Petro Iran Development Company (PEDCO) |
|  |  |
| EPC CONTRACTOR: | Joint Venture of : Hirgan Energy – Design & Inspection(D&I) Companies |
| VENDOR: | IDRIL KHAVARMIANEH (IDR) |
| EXECUTOR:  | Executor is the party which carries out all or part of construction and/or commissioning for the project. |
| THIRD PARTY INSPECTOR (TPI): | Third Party Inspector |
| SHALL: | Is used where a provision is mandatory. |
| SHOULD: | Is used where a provision is advisory only. |
| WILL:  | Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR. |
| MAY:  | Is used where a provision is completely discretionary. |
|  |  |

1. **USING CODES:**

The codes, used for analysis and design of this foundation are:

* AISC-360-10-ASD for Steel Design
* API 650-2021 (Welded Tanks for Oil Storage)
* MECHANICAL GA For Fire Water Tank 2031A
* National Building Regulations-Topic 10
* 2800 Code for seismic design of buildings
* National Building Regulations- Topic 6
* Iranian Seismic Design Code for Oil industries (3nd Edition)-1395 (Pub No.38)
1. **TRIAL SIZING:**
* Roof type: Cone Tank Diameter: ID 13.0 m
* Tank Height: 9.5 m
* Roof ceiling Slope: 5.7’≡10%
* Roof Ceiling Thk.: 8 mm
1. **LOADING:**

The design loads applied for structural analysis include Dead load, Live load, wind load and Seismic load.

**A) Dead Load:**

**AI) Ceiling:**

**1-Roof:**

 Plate 8 mm

**AII) Structure**

 SAP2000 Software has considered weight of structural members automatically.

**B) Snow Load(S):**

**1-Roof:** $P\_{r}=I\_{s}C\_{n}C\_{h}C\_{s}P\_{s}=23.7$

**(Binak)** $P\_{s}=25 {kg}/{m^{2}}$;

$I\_{s}=1.2$; $C\_{n}=0.8$; $C\_{s}=0.989$; $C\_{h}=1.0$

**B) Live Load (LLr):**

 L.L=100  According to API 650 - Edition 2021

**C) Asymmetric Snow Load:**

 According to National Building Regulations- Topic 6

* α=5.7’ ≡10% ≥ 4%

$h\_{d}=0.12\sqrt[3]{l}\_{u}\sqrt[4]{100P\_{s}+50}-0.5=0.34 m$ $l\_{u}=6.5 m$

${\frac{8}{3}h\_{d}}/{\sqrt{i}}=2.87 m$ $i=0.1$ $γ=0.43P\_{s}+2.2=2.3075 $

$h\_{d}γ\sqrt{i}=0.248 {KN}/{m^{2}}$ $h\_{d}γ\sqrt{i}+P\_{r}=48.5 {kg}/{m^{2}}$ $0.3P\_{r}=7.11 {kg}/{m^{2}}$

S1=7.11× (0.29~1.7) = (2.06~12.09)

S2=23.7× (1.04~1.7) = (24.65~40.29)

S3=48.5× (0.29~1.04) = (14.07~50.44)

**D) Wind Load:**

Wind loads have been calculated according to:

**;** *V=120 km/hr;* ****

****

 According to National Building Regulations-Topic 6





;

;

For any Direction:

; 

For any Direction:

*P2E=68×1.2×1.0×-2= -163.2 kg/m² (0.29 m to 1.7 m) P2E= (47.3-277.4)*

*P3E=68×1.2×1.0×-1.0= -81.6 kg/m²; (0.29 m to 1.7 m) P3E= (23.7-138.7)*

Finally total loads would be as below:

 These wind loads have been applied to roof structural members in sap2000 model with respect to their share of roof area.

**E) Seismic Load:**

Earthquake loads have been calculated according to 038 & API650 13 ED. Code for seismic design of buildings:

*Seismic Use Group: III*

*Soil Type: IV (Worst Case)*

*Important factor (I): 1.5*

*Scaling Factor (Q) 1.0*

*Ai= SDSI/R*

*Sp=0.2 S1=1.25Sp=0.25 Ss=2.5.Sp=0.5*

*Fa=1.7 SDS=2/3(0.9Fa.SS)=0.51 Fv=3.0 SD1=2/3(Fv.S1)=0.5*

*T0=0.2 SD1/ SDS=0.65 Ts= SD1/ SDS=0.98*

*T0 < T=0.3 < Ts SA=SDS*

*R=3.5 Ai= SDSI/R=0.218*

*:* Weight of building which participate in earthquake.

Earthquake loads have been calculated according to 2800 Code for seismic design of buildings:

*Soil Type: IV Ts=1.0 T0=0.15 T=0.05H0.75=0.3*

*Important factor (I): 1.4*

*S0=1.1 S=1.75 Iw=1.4 B1=1+S=2.75*

*C=ABI/R=0.3×2.75×1.4/3.5=0.33*

*Vumin=1.6AIW/Ru: Ru=3.5 Vumin=0.224W Cmin=0.224*

*Vertical Seismic Load: (Bay=13 m<15 m → Not Needed)*

*Ev=0.6AI × (W) =0.252W (According to 2800)*

These seismic loads have been applied to all points in sap2000 model automatically by sap2000 program.

1. ***STRUCTURE* *ANALYSIS:***

The 3-dimensional structural analysis will be performed using “SAP 2000 V. 19”

***General Input Data:***

Table: Coordinate Systems

| Table: Coordinate Systems |
| --- |
| Name | Type | X | Y | Z | AboutZ | AboutY | AboutX |
|  |  | m | m | m | Degrees | Degrees | Degrees |
| GLOBAL | Cylindrical | 0. | 0. | 0. | 0. | 0. | 0. |

Table: Grid Lines

|  |  |  | Table: Grid Lines,  |
| --- | --- | --- | --- |
| CoordSys | AxisDir | GridID | XRYZCoord | TAngle | LineType | LineColor | Visible | BubbleLoc | AllVisible | BubbleSize |
|  |  |  | m | Degrees |  |  |  |  |  | m |
| GLOBAL | R | A | 0. |  | Primary | 10461087 | Yes | End | Yes | 0.25 |
| GLOBAL | R | B | 1.1 |  | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | R | E | 3.26 |  | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | R | C | 4.88 |  | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | R | D | 6.5 |  | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 1 |  | 0. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 2 |  | 15. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 3 |  | 30. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 4 |  | 45. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 5 |  | 60. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 6 |  | 75. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 7 |  | 90. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 8 |  | 105. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 9 |  | 120. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 10 |  | 135. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 11 |  | 150. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 12 |  | 165. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 13 |  | 180. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 14 |  | 195. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 15 |  | 210. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 16 |  | 225. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 17 |  | 240. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 18 |  | 255. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 19 |  | 270. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 20 |  | 285. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 21 |  | 300. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 22 |  | 315. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 23 |  | 330. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | T | 24 |  | 345. | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | Z | Z1 | 0. |  | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | Z | Z2 | 0.195 |  | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | Z | Z2.1 | 0.39 |  | Primary | 10461087 | Yes | End |  |  |
| GLOBAL | Z | Z3 | 0.65 |  | Primary | 10461087 | Yes | End |  |  |

Table: Material Properties 03a - Steel Data,

|  |  | Table: Material Properties 03a -  |
| --- | --- | --- |
| Material | Fy | Fu | EffFy | EffFu | SSCurveOpt | SSHysType | SHard | SMax | SRup | FinalSlope |
|  | Kgf/m2 | Kgf/m2 | Kgf/m2 | Kgf/m2 |  |  |  |  |  |  |
| ST37 | 24000000. | 37000000. | 24000000. | 37000000. | Simple | Kinematic | 0.02 | 0.14 | 0.2 | -0.1 |

Table: Frame Section Properties 01 - General, Part 1 of 5

| Table: Frame Section Properties 01 - General, Part 1 of 5 |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| SectionName | Material | Shape | t3 | t2 | tf | tw | t2b | tfb | Area | TorsConst | I33 |
|  |  |  | m | m | m | m | m | m | m2 | m4 | m4 |
| B1 | ST37 | SD Section |  |  |  |  |  |  | 0.0092 | 0.000088 | 0.000047 |
| IPE160 | ST37 | I/Wide Flange | 0.16 | 0.082 | 0.0074 | 0.005 | 0.082 | 0.0074 | 0.00201 | 3.540E-08 | 8.690E-06 |
| L80X8 | ST37 | Angle | 0.08 | 0.08 | 0.008 | 0.008 |  |  | 0.001227 | 2.594E-08 | 7.224E-07 |

Table: Frame Section Properties 01 - General, Part 2 of 5

| SectionName | I22 | I23 | AS2 | AS3 | S33 | S22 | Z33 | Z22 | R33 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | m4 | m4 | m2 | m2 | m3 | m3 | m3 | m3 | m |
| B1 | 0.000085 | 0. | 0.003284 | 0.006096 | 0.000468 | 0.000635 | 0.000544 | 0.000788 | 0.071322 |
| IPE160 | 6.830E-07 | 0. | 0.0008 | 0.001011 | 0.000109 | 0.000017 | 0.000124 | 0.000026 | 0.065752 |
| L80X8 | 7.224E-07 | 4.365E-07 | 0.00064 | 0.00064 | 0.000013 | 0.000013 | 0.000023 | 0.000023 | 0.024264 |

Table: Frame Section Properties 01 - General, Part 4 of 5

| Table: Frame Section Properties 01 - General, Part 4 of 5 |  |  |  |  |
| --- | --- | --- | --- | --- |
| SectionName | R22 | ConcCol | ConcBeam | Color | TotalWt | TotalMass | FromFile | AMod | A2Mod | A3Mod | JMod |
|  | m |  |  |  | Kgf | Kgf-s2/m |  |  |  |  |  |
| B1 | 0.095848 | No | No | Red | 497.72 | 50.75 | No | 1. | 1. | 1. | 1. |
| IPE160 | 0.018434 | No | No | Magenta | 2059.65 | 210.03 | Yes | 1. | 1. | 1. | 1. |
| L80X8 | 0.024264 | No | No | White | 491.22 | 50.09 | Yes | 1. | 1. | 1. | 1. |

Table: Frame Section Properties 01 - General, Part 5 of 5

| SectionName | I2Mod | I3Mod | MMod | WMod | SectInFile | FileName | GUID | Notes |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
| B1 | 1. | 1. | 1. | 1. |  |  |  | Added 3/29/2017 11:02:44 AM |
| IPE160 | 1. | 1. | 1. | 1. | IPE160 | c:\program files\computers and structures\sap2000 19\euro.pro |  | Imported 3/29/2017 12:37:25 PM from Euro.pro |
| L80X8 | 1. | 1. | 1. | 1. | L80X8 | c:\program files\computers and structures\sap2000 19\euro.pro |  | Imported 3/29/2017 12:37:48 PM from Euro.pro |

Table: Area Section Properties, Part 1 of 3

| Table: Area Section Properties, Part 1 of 3 |  |  |
| --- | --- | --- |
| Section | Material | MatAngle | AreaType | Type | DrillDOF | Thickness | BendThick | Arc | InComp | CoordSys |
|  |  | Degrees |  |  |  | m | m | Degrees |  |  |
| Roof Shell | ST37 | 0. | Shell | Shell-Thin | Yes | 0.008 | 0.008 |  |  |  |

Table: Area Section Properties, Part 2 of 3

| Section | Color | TotalWt | TotalMass | F11Mod | F22Mod | F12Mod | M11Mod | M22Mod | M12Mod | V13Mod | V23Mod | MMod | WMod |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Kgf | Kgf-s2/m |  |  |  |  |  |  |  |  |  |  |
| Roof Shell | Yellow | 8063.47 | 822.24 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 1. | 1. | 1. | 1. |

Table: Area Section Properties, Part 3 of 3

| Table: Area Section Properties, Part 3 of 3 |
| --- |
| Section | GUID | Notes |
|  |  |  |
| Roof Shell |  | Added 2008/01/06 01:34:38 ?.? |

Table: Load Pattern Definitions

| Table: Load Pattern Definitions |
| --- |
| LoadPat | DesignType | SelfWtMult | AutoLoad | GUID | Notes |
|  |  |  |  |  |  |
| DEAD | Dead | 1. |  |  |  |
| LL | Live | 0. |  |  |  |
| WIND | Wind | 0. | None |  |  |
| Snow(asymmetric) | Snow | 0. |  | aeef0373-9b98-4d99-b7a1-dcaac379e965 |  |
| Temp.(+) | Temperature | 0. |  | 44417da3-c2fc-4bfe-b219-b86b39c398ca |  |
| EQ | Quake | 0. | USER COEFF | db46d43c-7d7b-406a-b0c4-728182458b82 |  |
| Temp.(-) | Temperature | 0. |  | d826c701-cd22-43ec-84aa-43bd382e9575 |  |
| EQ(V) | Other | 0.252 |  | 980ede88-2c1c-42b1-bbaa-0b30ecc947ad |  |

Table: Case - Static 1 - Load Assignments

| Table: Case - Static 1 - Load Assignments |
| --- |
| Case | LoadType | LoadName | LoadSF |
|  |  |  |  |
| DEAD | Load pattern | DEAD | 1. |
| WIND | Load pattern | WIND | 1. |
| LIVE | Load pattern | LL | 1. |
| LIVE | Load pattern | LL | 1. |
| LL(asymmetric) | Load pattern | Snow(asymmetric) | 1. |
| Temp.(+) | Load pattern | Temp.(+) | 1. |
| EQ | Load pattern | EQ | 1. |
| Temp.(-) | Load pattern | Temp.(-) | 1. |
| EQ(V) | Load pattern | EQ(V) | 1. |

Table: Load Case Definitions, Part 1 of 2

| Table: Load Case Definitions, Part 1 of 2 |  |  |
| --- | --- | --- |
| Case | Type | InitialCond | ModalCase | BaseCase | MassSource | DesTypeOpt | DesignType | DesActOpt | DesignAct |
|  |  |  |  |  |  |  |  |  |  |
| DEAD | LinStatic | Zero |  |  |  | Prog Det | Dead | Prog Det | Non-Composite |
| MODAL | LinModal | Zero |  |  |  | Prog Det | Other | Prog Det | Other |
| WIND | LinStatic | Zero |  |  |  | Prog Det | Wind | Prog Det | Short-Term Composite |
| LIVE | LinStatic | Zero |  |  |  | Prog Det | Live | Prog Det | Short-Term Composite |
| LL(asymmetric) | LinStatic | Zero |  |  |  | Prog Det | Snow | Prog Det | Short-Term Composite |
| Temp.(+) | LinStatic | Zero |  |  |  | Prog Det | Temperature | Prog Det | Short-Term Composite |
| EQ | LinStatic | Zero |  |  |  | Prog Det | Quake | Prog Det | Short-Term Composite |
| Temp.(-) | LinStatic | Zero |  |  |  | Prog Det | Temperature | Prog Det | Short-Term Composite |
| EQ(V) | LinStatic | Zero |  |  |  | Prog Det | Other | Prog Det | Other |

Table: Load Case Definitions, Part 2 of 2

| Case | AutoType | RunCase | CaseStatus | GUID | Notes |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| DEAD | None | Yes | Finished |  |  |
| MODAL | None | Yes | Finished |  |  |
| WIND | None | Yes | Finished |  |  |
| LIVE | None | Yes | Finished |  |  |
| LL(asymmetric) | None | Yes | Finished | 832c8f9c-a30d-4be5-a81e-8f5312ff9a26 |  |
| Temp.(+) | None | Yes | Finished | d745dd9f-4da3-4517-a618-f9690fede060 |  |
| EQ | None | Yes | Finished | cf38ebd5-59dd-466d-a44c-c6de0ad746a7 |  |
| Temp.(-) | None | Yes | Finished | f8930cf6-ac23-49bd-bf51-c3c239085e05 |  |
| EQ(V) | None | Yes | Finished | 64cd170c-b5d1-4275-8038-c69bc1625fca |  |

Table: Auto Seismic - User Coefficient

| Table: Auto Seismic - User Coefficient,  |  |
| --- | --- |
| LoadPat | Dir | PercentEcc | EccOverride | UserZ | C | K | WeightUsed | BaseShear |
|  |  |  |  |  |  |  | Kgf | Kgf |
| EQ | X | 0.05 | No | No | 0.35 | 1. | 12907.99 | 4517.8 |

Table: Mass Source

| Table: Mass Source |
| --- |
| MassSource | Elements | Masses | Loads | IsDefault | LoadPat | Multiplier |
|  |  |  |  |  |  |  |
| MSSSRC1 | No | No | Yes | Yes | DEAD | 1. |
| MSSSRC1 |  |  |  |  | LL | 0.4 |

Table: Combination Definitions,

|  |  | Table: Combination Definitions |
| --- | --- | --- |
| ComboName | ComboType | AutoDesign | CaseType | CaseName | ScaleFactor | SteelDesign | Notes |
|  |  |  |  |  |  |  |  |
| UDSTL1 | Linear Add | No | Linear Static | DEAD | 1.4 | Strength | Dead Only; Strength |
| UDSTL2 | Linear Add | No | Linear Static | DEAD | 1.2 | Strength | Dead + Live + Snow (Partial); Strength |
| UDSTL2 |  |  | Linear Static | LIVE | 1.6 |  |  |
| UDSTL2 |  |  | Linear Static | LL(asymmetric) | 0.5 |  |  |
| UDSTL3 | Linear Add | No | Linear Static | DEAD | 1.2 | Strength | Dead + Live + Snow; Strength |
| UDSTL3 |  |  | Linear Static | LL(asymmetric) | 1.6 |  |  |
| UDSTL3 |  |  | Linear Static | LIVE | 1. |  |  |
| UDSTL4 | Linear Add | No | Linear Static | DEAD | 1.2 | Strength |  |
| UDSTL4 |  |  | Linear Static | LL(asymmetric) | 1.6 |  |  |
| UDSTL4 |  |  | Linear Static | WIND | 0.8 |  |  |
| UDSTL5 | Linear Add | No | Linear Static | DEAD | 1.2 | Strength |  |
| UDSTL5 |  |  | Linear Static | LL(asymmetric) | 0.5 |  |  |
| UDSTL5 |  |  | Linear Static | WIND | 1.6 |  |  |
| UDSTL5 |  |  | Linear Static | LIVE | 1. |  |  |
| UDSTL9 | Linear Add | No | Linear Static | DEAD | 1.2 | Strength | Dead (min) - Wind; Strength |
| UDSTL9 |  |  | Linear Static | EQ | -1. |  |  |
| UDSTL9 |  |  | Linear Static | LIVE | 1. |  |  |
| UDSTL9 |  |  | Linear Static | EQ(V) | 1. |  |  |
| UDSTL8 | Linear Add | No | Linear Static | DEAD | 0.9 | Strength | Dead + Live + Static Earthquake; Strength |
| UDSTL8 |  |  | Linear Static | EQ | 1. |  |  |
| UDSTL8 |  |  | Linear Static | EQ(V) | 1. |  |  |
| UDSTL6 | Linear Add | No | Linear Static | DEAD | 1.2 | Strength | Dead + Live - Static Earthquake; Strength |
| UDSTL6 |  |  | Linear Static | LL(asymmetric) | 0.2 |  |  |
| UDSTL6 |  |  | Linear Static | EQ | 1. |  |  |
| UDSTL6 |  |  | Linear Static | EQ(V) | 1. |  |  |
| UDSTL6 |  |  | Linear Static | LIVE | 1. |  |  |
| UDSTL7 | Linear Add | No | Linear Static | DEAD | 0.9 | Strength | Dead + Live + Snow (Partial); Strength |
| UDSTL7 |  |  | Linear Static | WIND | 1.6 |  |  |
| UDSTL10 | Linear Add | No | Linear Static | DEAD | 1.2 | Strength | Dead + Live + Snow (Partial); Strength |
| UDSTL10 |  |  | Linear Static | LIVE | 1.6 |  |  |
| UDSTL10 |  |  | Linear Static | Temp.(+) | 1. |  |  |
| UDSTL10 |  |  | Linear Static | LL(asymmetric) | 1.6 |  |  |
| UDSTL11 | Linear Add | No | Linear Static | DEAD | 1.2 | Strength | Dead + Live + Snow (Partial); Strength |
| UDSTL11 |  |  | Linear Static | LIVE | 0.5 |  |  |
| UDSTL11 |  |  | Linear Static | Temp.(-) | 1.2 |  |  |
| UDSTL11 |  |  | Linear Static | LL(asymmetric) | 0.5 |  |  |
| UDSTL12 | Linear Add | No | Linear Static | DEAD | 1.2 | Strength | Dead + Live + Snow (Partial); Strength |
| UDSTL12 |  |  | Linear Static | LIVE | 1.6 |  |  |
| UDSTL12 |  |  | Linear Static | Temp.(-) | 1. |  |  |
| UDSTL12 |  |  | Linear Static | LL(asymmetric) | 1.6 |  |  |
| UDSTL13 | Linear Add | No | Linear Static | DEAD | 1.2 | Strength | Dead + Live + Snow (Partial); Strength |
| UDSTL13 |  |  | Linear Static | LIVE | 0.5 |  |  |
| UDSTL13 |  |  | Linear Static | Temp.(+) | 1.2 |  |  |
| UDSTL13 |  |  | Linear Static | LL(asymmetric) | 0.5 |  |  |







1. ***STRUCTURE DESIGN:***

DESIGN:

Steel structure design has performed according to AISC-ASD-89 by SAP2000 program.

# Input Design Data:

1. **K-Value (Effective Length Factor)**

K-Value used for determining column slenderness. K-Value of columns and rafters for braced frame direction has taken 1.0.

# Out Put Design Data:

Table: Steel Design 1 - Summary Data - AISC 360-10

|  |  |  |  | Table: Steel Design 1 - Summary Data - AISC 360-10,  |
| --- | --- | --- | --- | --- |
| Frame | DesignSect | DesignType | Status | Ratio | RatioType | Combo | Location | ErrMsg | WarnMsg |
|  |  |  |  |  |  |  | m |  |  |
| 26 | B1 | Beam | No Messages | 0.272933 | PMM | UDSTL10 | 0. | No Messages | No Messages |
| 27 | B1 | Beam | No Messages | 0.274187 | PMM | UDSTL10 | 0. | No Messages | No Messages |
| 28 | B1 | Beam | No Messages | 0.275995 | PMM | UDSTL10 | 0. | No Messages | No Messages |
| 29 | B1 | Beam | No Messages | 0.277941 | PMM | UDSTL10 | 0. | No Messages | No Messages |
| 30 | B1 | Beam | No Messages | 0.280494 | PMM | UDSTL10 | 0. | No Messages | No Messages |
| 31 | B1 | Beam | No Messages | 0.281632 | PMM | UDSTL10 | 0. | No Messages | No Messages |
| 32 | B1 | Beam | No Messages | 0.280021 | PMM | UDSTL10 | 0. | No Messages | No Messages |
| 33 | B1 | Beam | No Messages | 0.274572 | PMM | UDSTL10 | 0. | No Messages | No Messages |
| 34 | B1 | Beam | No Messages | 0.266473 | PMM | UDSTL10 | 0. | No Messages | No Messages |
| 35 | B1 | Beam | No Messages | 0.261601 | PMM | UDSTL10 | 0. | No Messages | No Messages |
| 36 | B1 | Beam | No Messages | 0.259172 | PMM | UDSTL10 | 0. | No Messages | No Messages |
| 37 | B1 | Beam | No Messages | 0.257872 | PMM | UDSTL10 | 0. | No Messages | No Messages |
| 38 | B1 | Beam | No Messages | 0.257872 | PMM | UDSTL10 | 0.28716 | No Messages | No Messages |
| 39 | B1 | Beam | No Messages | 0.259172 | PMM | UDSTL10 | 0.28716 | No Messages | No Messages |
| 40 | B1 | Beam | No Messages | 0.261601 | PMM | UDSTL10 | 0.28716 | No Messages | No Messages |
| 41 | B1 | Beam | No Messages | 0.266473 | PMM | UDSTL10 | 0.28716 | No Messages | No Messages |
| 42 | B1 | Beam | No Messages | 0.274572 | PMM | UDSTL10 | 0.28716 | No Messages | No Messages |
| 43 | B1 | Beam | No Messages | 0.280021 | PMM | UDSTL10 | 0.28716 | No Messages | No Messages |
| 44 | B1 | Beam | No Messages | 0.281632 | PMM | UDSTL10 | 0.28716 | No Messages | No Messages |
| 45 | B1 | Beam | No Messages | 0.280494 | PMM | UDSTL10 | 0.28716 | No Messages | No Messages |
| 46 | B1 | Beam | No Messages | 0.277941 | PMM | UDSTL10 | 0.28716 | No Messages | No Messages |
| 47 | B1 | Beam | No Messages | 0.275995 | PMM | UDSTL10 | 0.28716 | No Messages | No Messages |
| 48 | B1 | Beam | No Messages | 0.274187 | PMM | UDSTL10 | 0.28716 | No Messages | No Messages |
| 49 | B1 | Beam | No Messages | 0.272933 | PMM | UDSTL10 | 0.28716 | No Messages | No Messages |
| 50 | IPE160 | Brace | No Messages | 0.769684 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 51 | IPE160 | Brace | No Messages | 0.761548 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 52 | IPE160 | Brace | No Messages | 0.76079 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 53 | IPE160 | Brace | No Messages | 0.761548 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 54 | IPE160 | Brace | No Messages | 0.769684 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 55 | IPE160 | Brace | No Messages | 0.772581 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 56 | IPE160 | Brace | No Messages | 0.776484 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 57 | IPE160 | Brace | No Messages | 0.78144 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 58 | IPE160 | Brace | No Messages | 0.787326 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 59 | IPE160 | Brace | No Messages | 0.794203 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 60 | IPE160 | Brace | No Messages | 0.830167 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 61 | IPE160 | Brace | No Messages | 0.835568 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 62 | IPE160 | Brace | No Messages | 0.839369 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 63 | IPE160 | Brace | No Messages | 0.813101 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 64 | IPE160 | Brace | No Messages | 0.812935 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 65 | IPE160 | Brace | No Messages | 0.813101 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 66 | IPE160 | Brace | No Messages | 0.839369 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 67 | IPE160 | Brace | No Messages | 0.835568 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 68 | IPE160 | Brace | No Messages | 0.830167 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 69 | IPE160 | Brace | No Messages | 0.794203 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 70 | IPE160 | Brace | No Messages | 0.787326 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 71 | IPE160 | Brace | No Messages | 0.78144 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 72 | IPE160 | Brace | No Messages | 0.776484 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 73 | IPE160 | Brace | No Messages | 0.772581 | PMM | UDSTL12 | 1.63169 | No Messages | No Messages |
| 9 | L80X8 | Beam | No Messages | 0.493249 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 10 | L80X8 | Beam | No Messages | 0.495601 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 11 | L80X8 | Beam | No Messages | 0.498572 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 12 | L80X8 | Beam | No Messages | 0.502017 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 13 | L80X8 | Beam | No Messages | 0.50576 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 14 | L80X8 | Beam | No Messages | 0.509573 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 15 | L80X8 | Beam | No Messages | 0.513089 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 16 | L80X8 | Beam | No Messages | 0.51595 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 17 | L80X8 | Beam | No Messages | 0.51796 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 18 | L80X8 | Beam | No Messages | 0.518998 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 19 | L80X8 | Beam | No Messages | 0.518998 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 20 | L80X8 | Beam | No Messages | 0.51796 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 21 | L80X8 | Beam | No Messages | 0.51595 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 22 | L80X8 | Beam | No Messages | 0.513089 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 23 | L80X8 | Beam | No Messages | 0.509573 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 24 | L80X8 | Beam | No Messages | 0.50576 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 25 | L80X8 | Beam | No Messages | 0.502017 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 74 | L80X8 | Beam | No Messages | 0.498572 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 75 | L80X8 | Beam | No Messages | 0.495601 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 76 | L80X8 | Beam | No Messages | 0.493249 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 77 | L80X8 | Beam | No Messages | 0.491622 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 78 | L80X8 | Beam | No Messages | 0.490791 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 79 | L80X8 | Beam | No Messages | 0.490791 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 80 | L80X8 | Beam | No Messages | 0.491622 | PMM | UDSTL10 | 0.42552 | No Messages | No Messages |
| 81 | L80X8 | Beam | No Messages | 0.588918 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 82 | L80X8 | Beam | No Messages | 0.590814 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 83 | L80X8 | Beam | No Messages | 0.593291 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 84 | L80X8 | Beam | No Messages | 0.59631 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 85 | L80X8 | Beam | No Messages | 0.599821 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 86 | L80X8 | Beam | No Messages | 0.603794 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 87 | L80X8 | Beam | No Messages | 0.607547 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 88 | L80X8 | Beam | No Messages | 0.610398 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 89 | L80X8 | Beam | No Messages | 0.612327 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 90 | L80X8 | Beam | No Messages | 0.613299 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 91 | L80X8 | Beam | No Messages | 0.613299 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 92 | L80X8 | Beam | No Messages | 0.612327 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 93 | L80X8 | Beam | No Messages | 0.610398 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 94 | L80X8 | Beam | No Messages | 0.607547 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 95 | L80X8 | Beam | No Messages | 0.603794 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 96 | L80X8 | Beam | No Messages | 0.599821 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 97 | L80X8 | Beam | No Messages | 0.59631 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 98 | L80X8 | Beam | No Messages | 0.593291 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 99 | L80X8 | Beam | No Messages | 0.590814 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 100 | L80X8 | Beam | No Messages | 0.588918 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 101 | L80X8 | Beam | No Messages | 0.587636 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 102 | L80X8 | Beam | No Messages | 0.586989 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 103 | L80X8 | Beam | No Messages | 0.586989 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |
| 104 | L80X8 | Beam | No Messages | 0.587636 | PMM | UDSTL10 | 0.42465 | No Messages | No Messages |

