PROJECT NAME	MS STEEL POOL DECK	DESIGNED :
		NOOR MOHAMMED

DESIGN BASIS REPORT

PROJECT NAME

AS-BUILT STRUCTURAL ANALYSIS
OF
MS - Steel Pool Deck

1606 Beach Boulevard, Biloxi,

Structural Engineer:* Noor Mohammad

***Structural Analysis Supervised and Commanded by:* Terry Moran, P.E.**

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DESIGN BASIS

Analysis Scope: This comprehensive structural evaluation validates the as-built steel pool deck assembly through rigorous finite element analysis, confirming code compliance across all applicable limit states and load combinations

Analysis comprises 180+ pages of calculations verifying full code compliance of the existing as-built structure for all structural elements and connections under governing load combinations.

A. LOCATION

The 1606 Beach Boulevard, Biloxi, MS - Steel Pool Deck As-Built Structural Analysis

B. COMPREHENSIVE CODE COMPLIANCE & DESIGN STANDARDS:

The structural design document is in general accordance with the requirements of the American codes and standards.

In the analysis, design and detailing of the MS steel deck, the latest editions of following American Standards has been referred.

- ACI 318 - Building Code Requirements for Structural Concrete
- AISC 360 - Specification for Structural Steel Buildings
- AISC 341 - Seismic Provisions for Structural Steel Buildings
- IBC / ASCE 7 Load Combinations (Full Envelope Analysis)
- AISI - North American Specification for Cold-Formed Steel
- ANSI/SDI C-2017 - Standard for Composite Steel Floor Deck
- ANSI/SDI NC-2017 - Standard for Non-Composite Steel Floor Deck
- ANSI/SDI RD-2017 - Standard for Steel Roof Deck
- ASCE 7 Wind Design Provisions:
- Risk Category II (Residential Occupancy)
- Exposure Category D (Unobstructed Wind Flow/Open to Sea)

- Ultimate Design Wind Speed: 180 mph (3-second gust)
- Gust Effect Factor Applied per Section 26.11

C. POOL-SPECIFIC STANDARDS:

- ICC-ES ESR-4370 - IGUI Pool Shell Evaluation Report

- IBC Chapter 31 - Special Construction (Swimming Pools)

- ASCE 7 Chapter 15 - Seismic Design Requirements (Fluid-Structure Interaction)

D.POOL SHELL SPECIFICATIONS PER ICC-ES ESR-4370:

- Shell Model: IGUI TUNIS Series

- ICC-ES Evaluation Report: ESR-4370

- Shell Dead Load: 1,843 lb. (836 kg)

- Design Water Load: 52,250 lb. (23,700 kg)

- Total Design Load on Structure: 55,764 lb. (25,294 kg)

- Pool Surface Area: 255.2 ft²

- Water Volume: 6,261 gallons (23,700 L)

E. MATERIAL SPECIFICATION

STEEL: Q355

Poisson's Ratio: 0.3

Young’s Modulus: 2.06X10^5 MPA

Co-efficient of Thermal Expansion: 1.2x10E -5 /k

Density of Steel: 7850 KG/M3

Grade of Structural Steel = Q 355

CONCRETE: 5000Psi

Poisson's Ratio: 0.2

Young’s Modulus: 27789.38 MPA

Co-efficient of Thermal Expansion: (0.0000099 /°C)

Density of Concrete: 2400 KG/M3

Grade of Structural Steel = Q 355

F. As-Built Structural System:

- Columns: HSS 8x8x15mm galvanized steel sections, composite with 5000 psi concrete fill

- Beams: HSS 8x8x15mm galvanized members with full moment connections

- Connections: Fully rigid connections on all axes with supplemental reinforcement plates

- Deck System: Composite steel deck with 4" thick 5000 psi concrete topping slab

- Corrosion Protection: Complete galvanization system per ASTM A123

G. GRAVITY LOADS

Dead Load: Self-weight of the structure (Frame): Considered by ETABS Model

Live Load: 2kN/m2 (41.78 lb. /ft²) on the deck slab

Pool load: size of pool 24 ft*12ft*4ft (depth)

Unit weight of water = 62.4 lb. /ft^3

Area = 24ft*12ft = 288 sq feet

Weight = volume*unit wt of water = 1152cub ft*62.4lb/cub ft

Load = 71884.8 lb. / 288 = 250 lb. /ft^2

H. Structural Analysis

ETABS Ultimate 20.0.0 Advanced Analysis Parameters

- Comprehensive 3D Finite Element Modeling of As-Built Conditions

- Pool loads incorporated as distributed area loads at precise as-built coordinates

- Field-verified structural member properties and geometric configurations

- Non-linear P-Delta analysis for second-order effects

- Dynamic response spectrum analysis for wind-induced vibrations

- Eigenvalue analysis for fundamental periods and mode shapes

I.DEFLECTIONS SERVICEABILITY LIMIT STATE VERIFICATION INCLUDING

- Live load deflection criteria (L/360)

- Total load deflection limits (L/240)

- Lateral drift limitations

- Vibration acceptance criteria for human comfort

- Connection capacity verification using limit state design methodology

- Load path continuity validated from pool shell through deck diaphragm to vertical lateral force resisting system

J.STRUCTURAL CAPACITY RESULTS

The analysis demonstrates the deck exhibits substantial reserve capacity with fully rigid moment connections providing structural redundancy throughout the system. Under the most severe load combination during high wind events (1.2D + 1.0W + 1.0L + 0.5Lr), the structure experiences maximum stress ratios of only 70-80% in localized sections, with the majority of the structural system operating well below 50% capacity. The composite HSS columns and rigid frame action create multiple load paths, ensuring exceptional performance and reliability in the demanding coastal environment, providing significant safety margins beyond code-required minimums.

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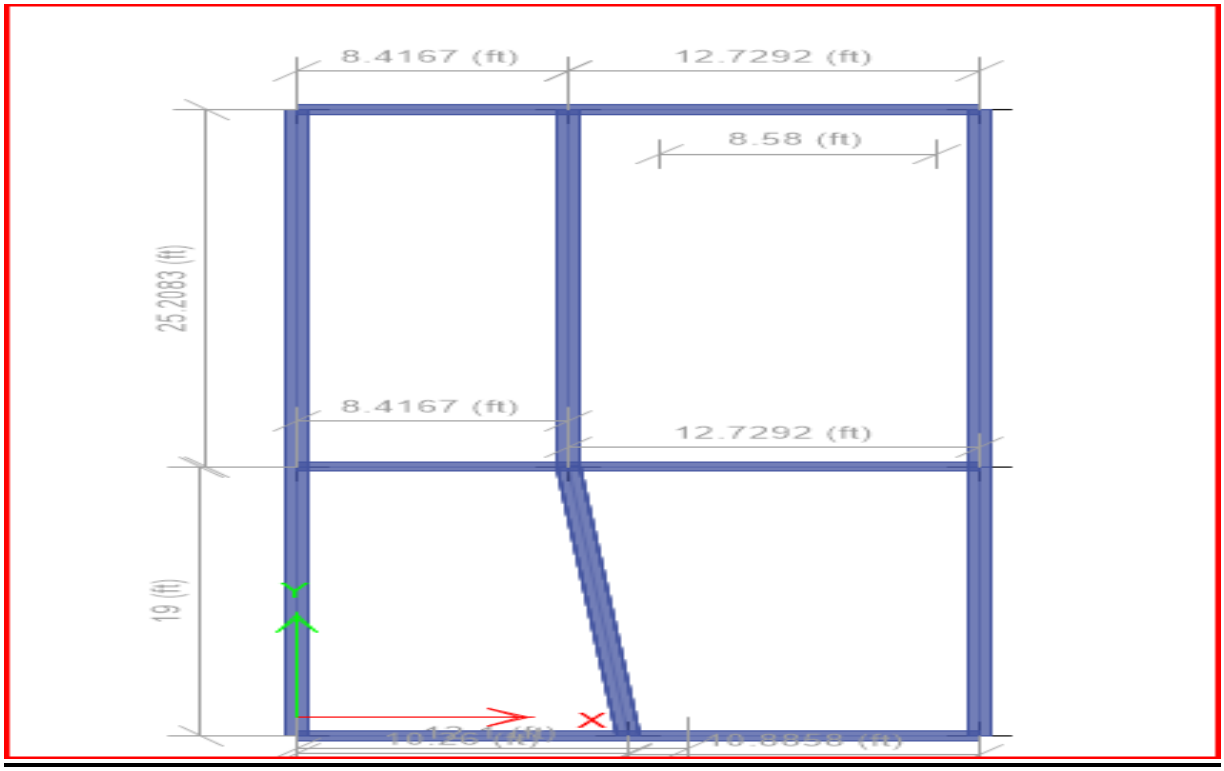
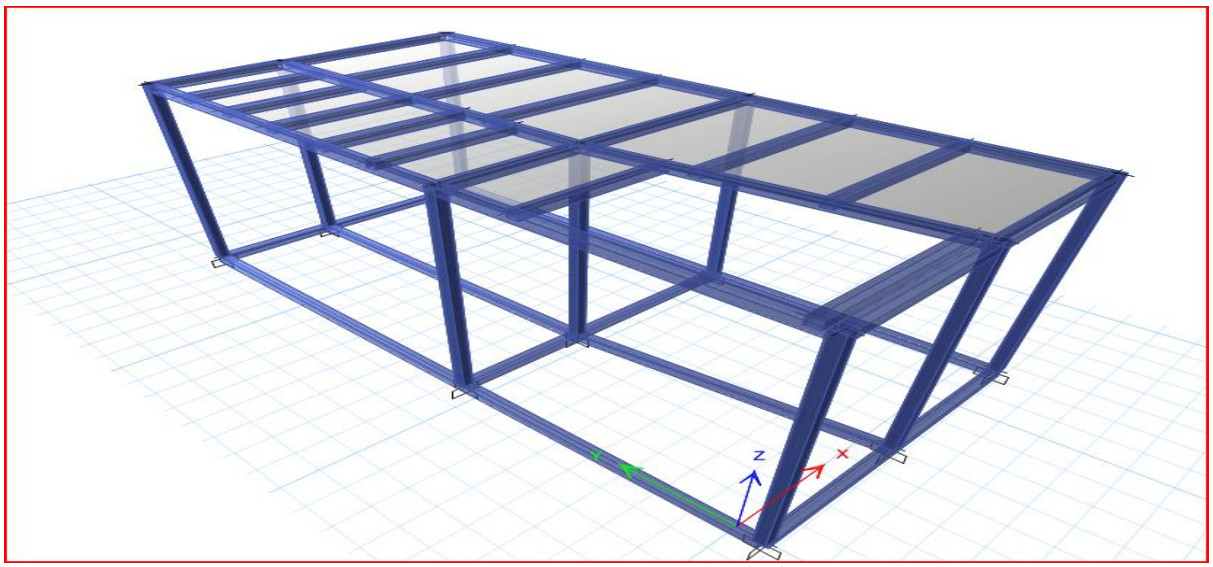
K. MODELLING & ANALYSIS IN ETABS



PLAN VIEW OF MS STEEL DECK



3-D VIEW OF MS STEEL DECK

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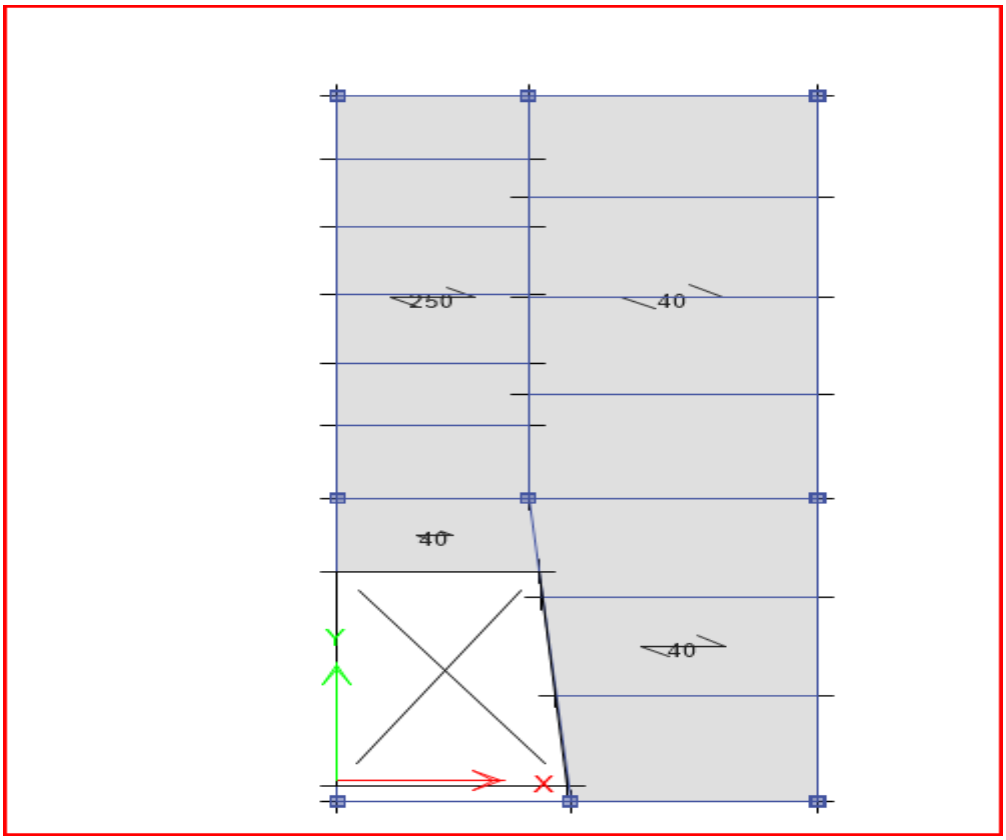
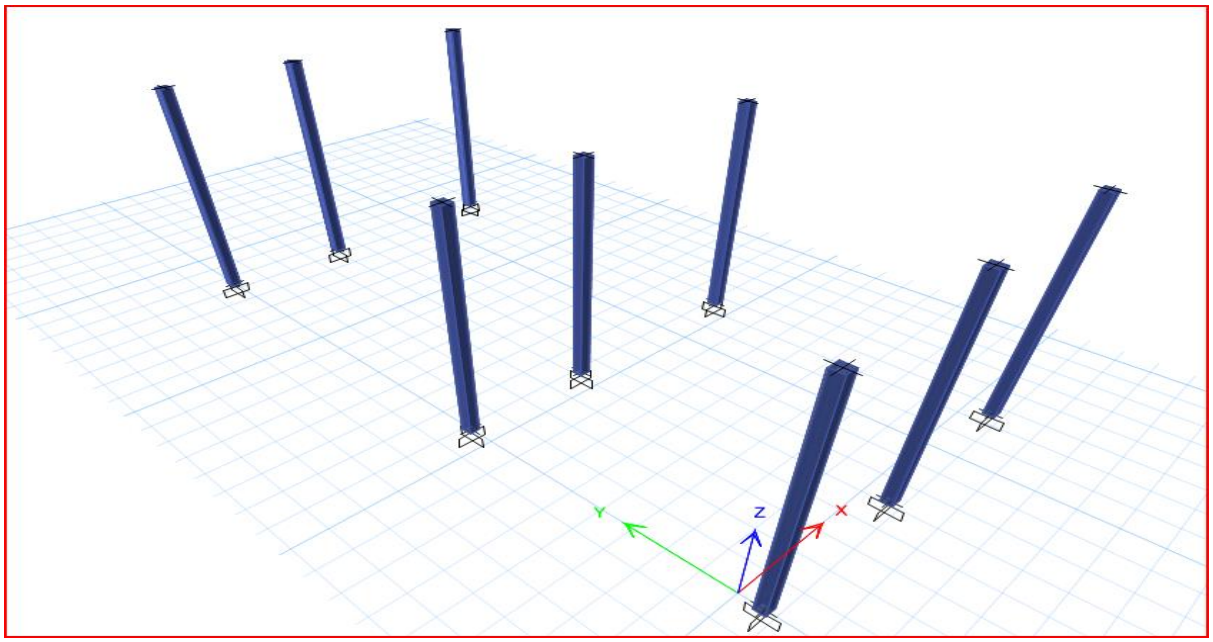


Pool and live load on deck slab



HSS COLUMN LAYOUT

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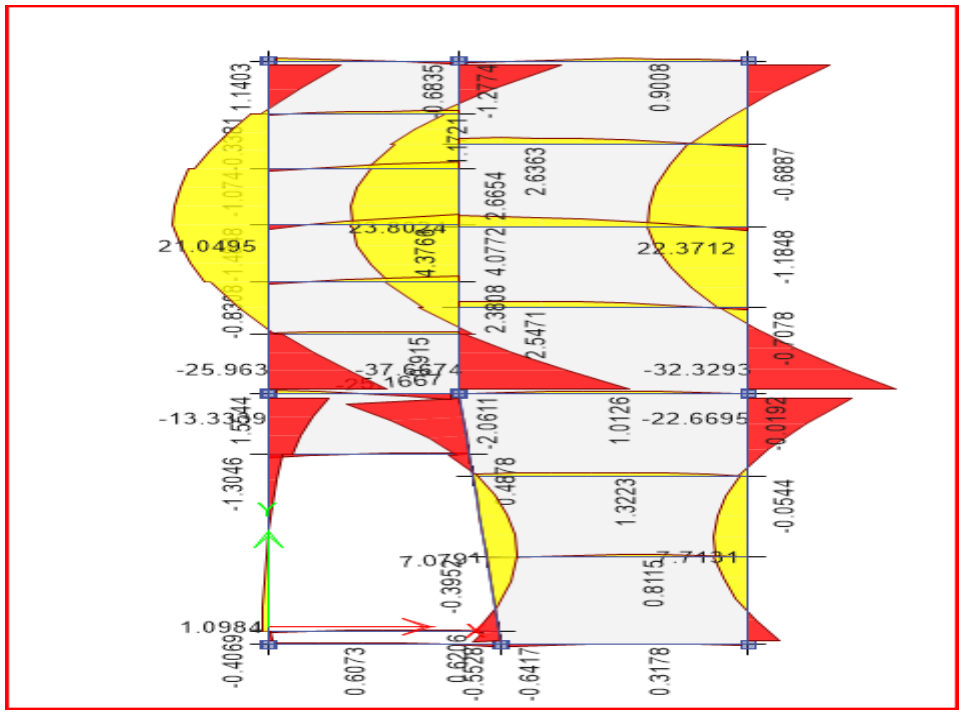
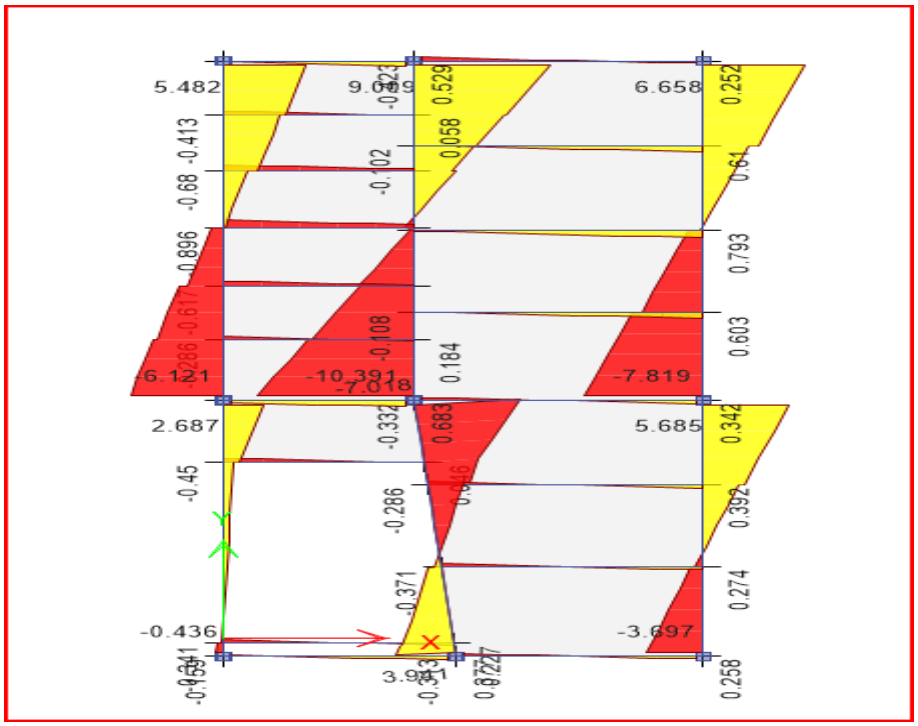


BENDING MOMENT DIAGRAM



SHEAR DIAGRAM

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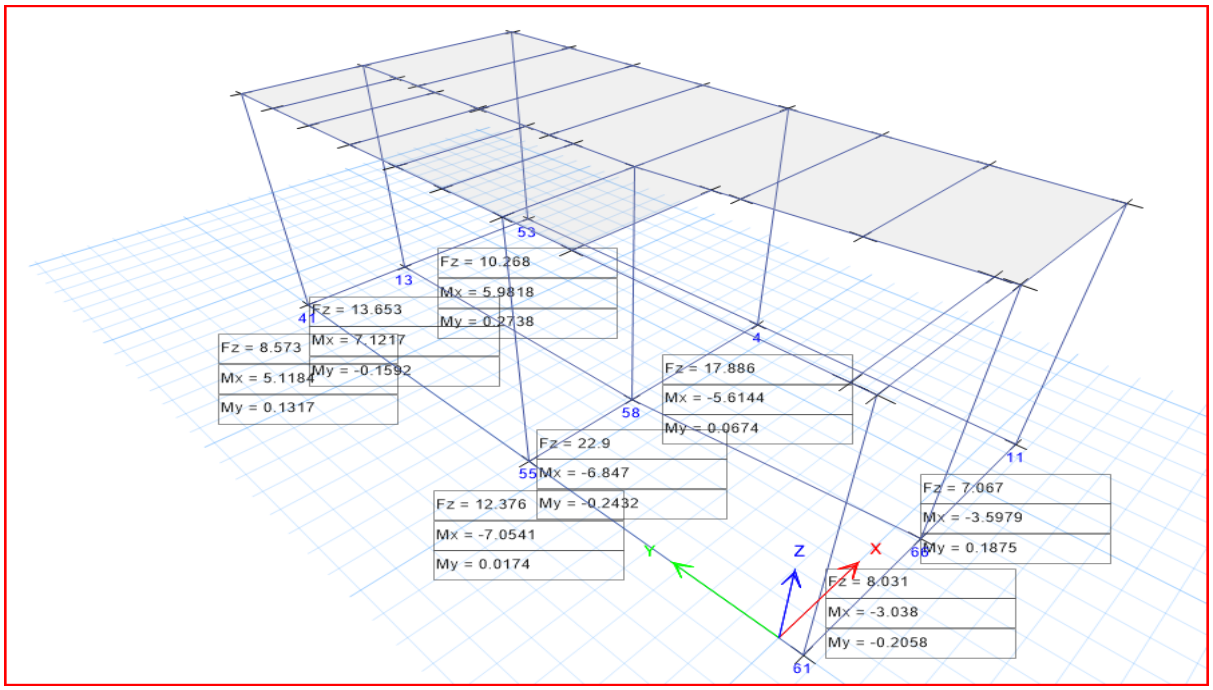
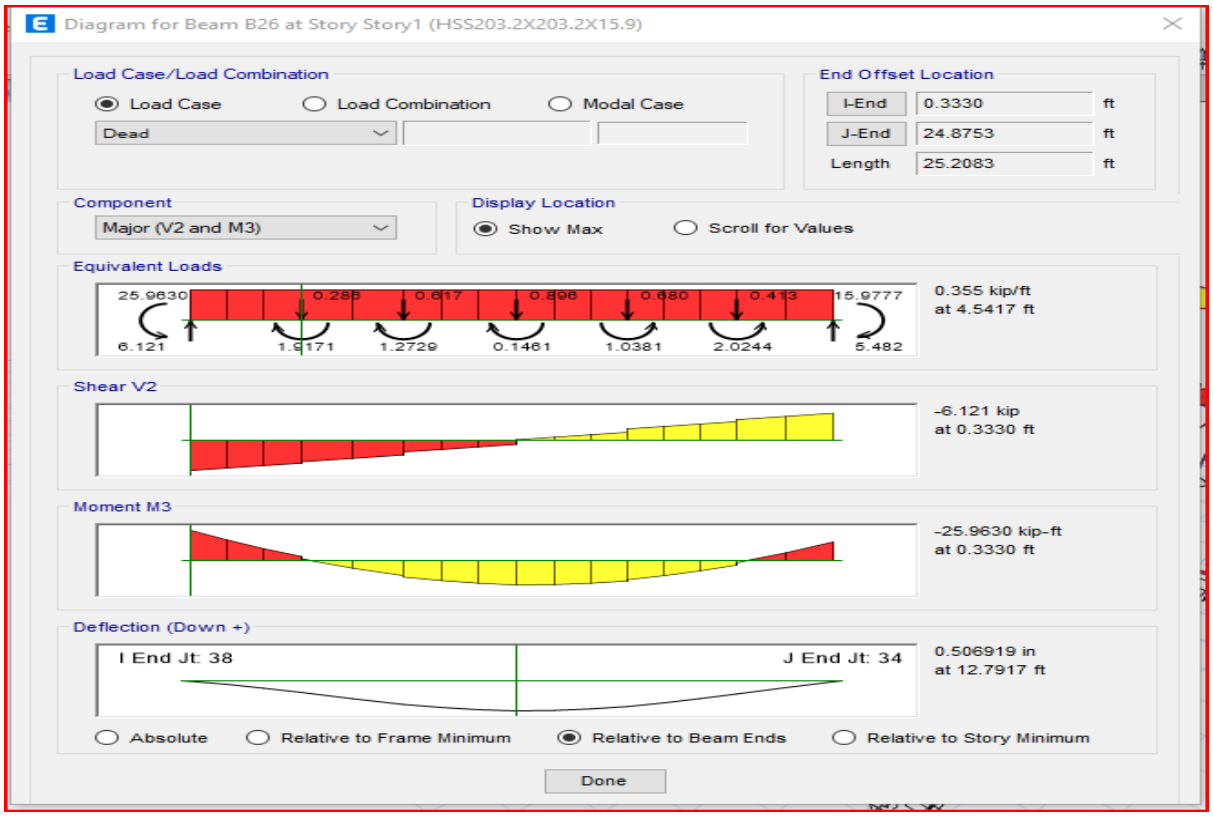


SUPPORT REACTION



DEFLECTION OF BEAM AS PER DEAD LOAD

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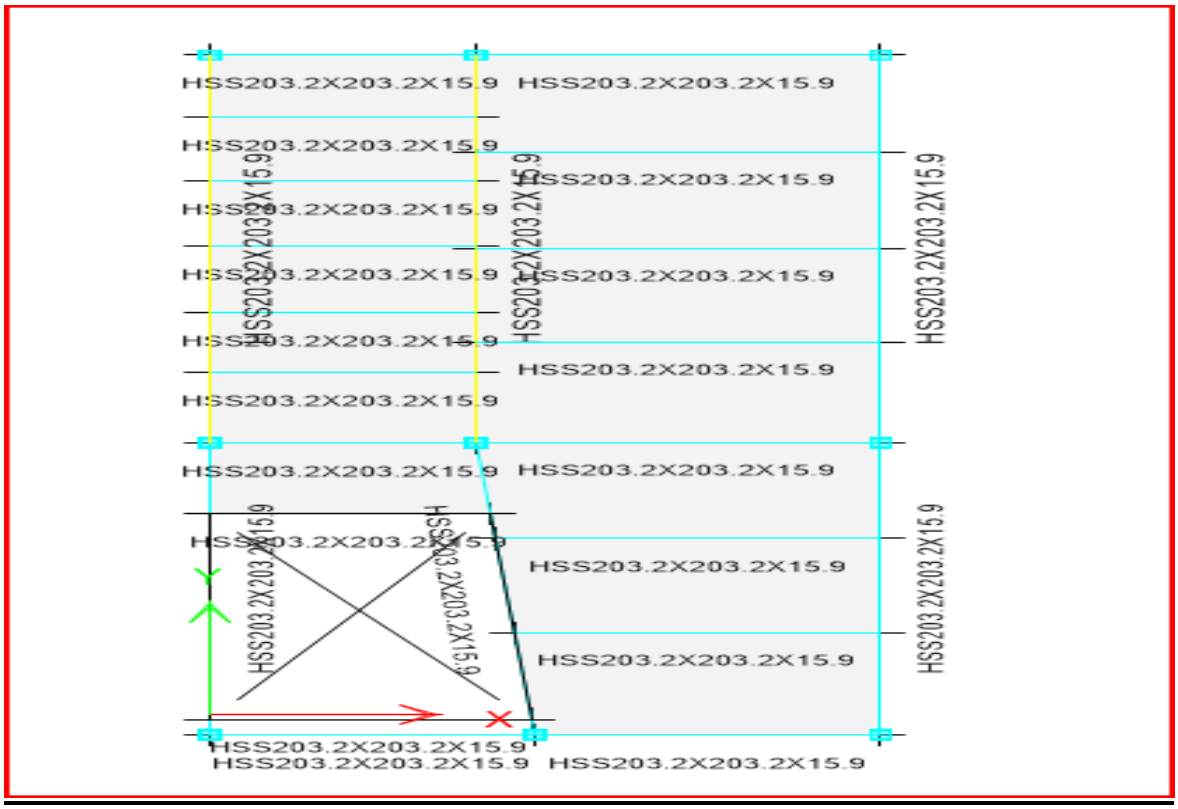
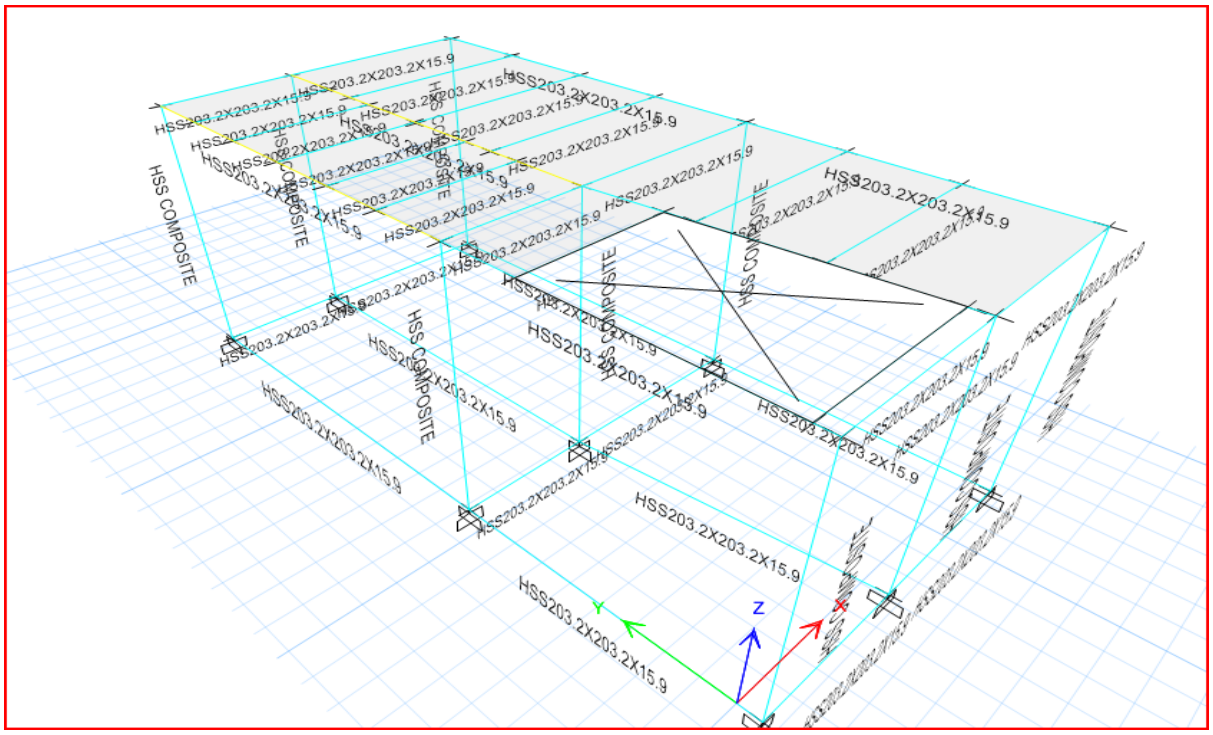
L. DESIGN RESULTS:



PLAN VIEW



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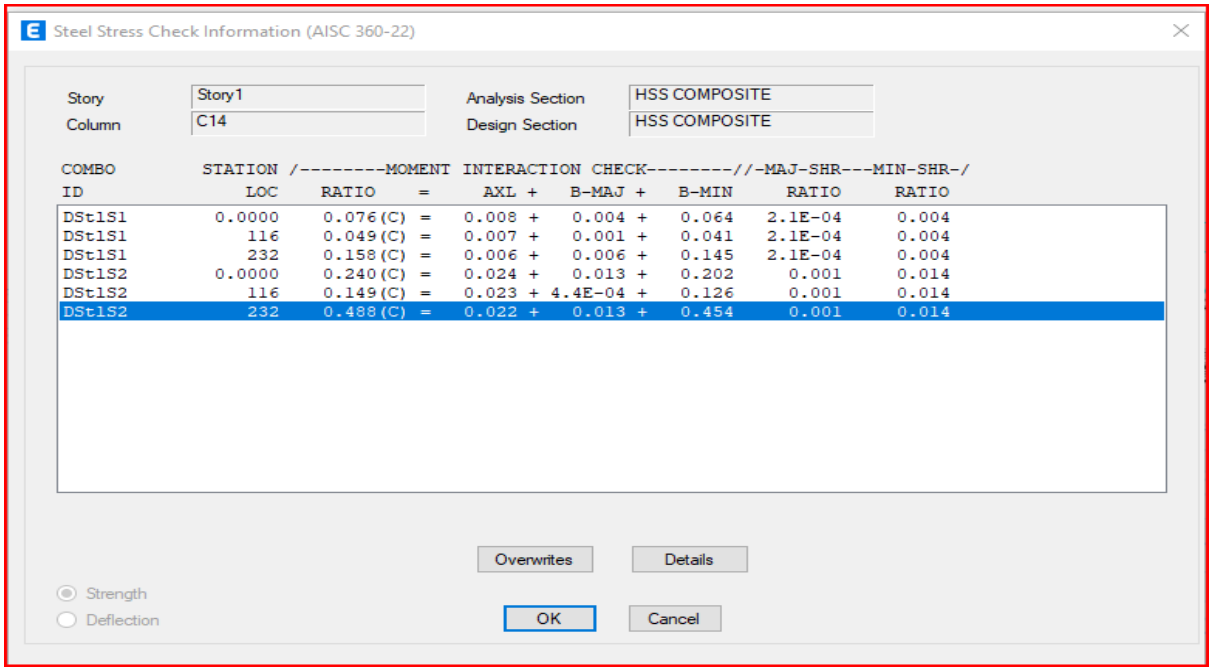
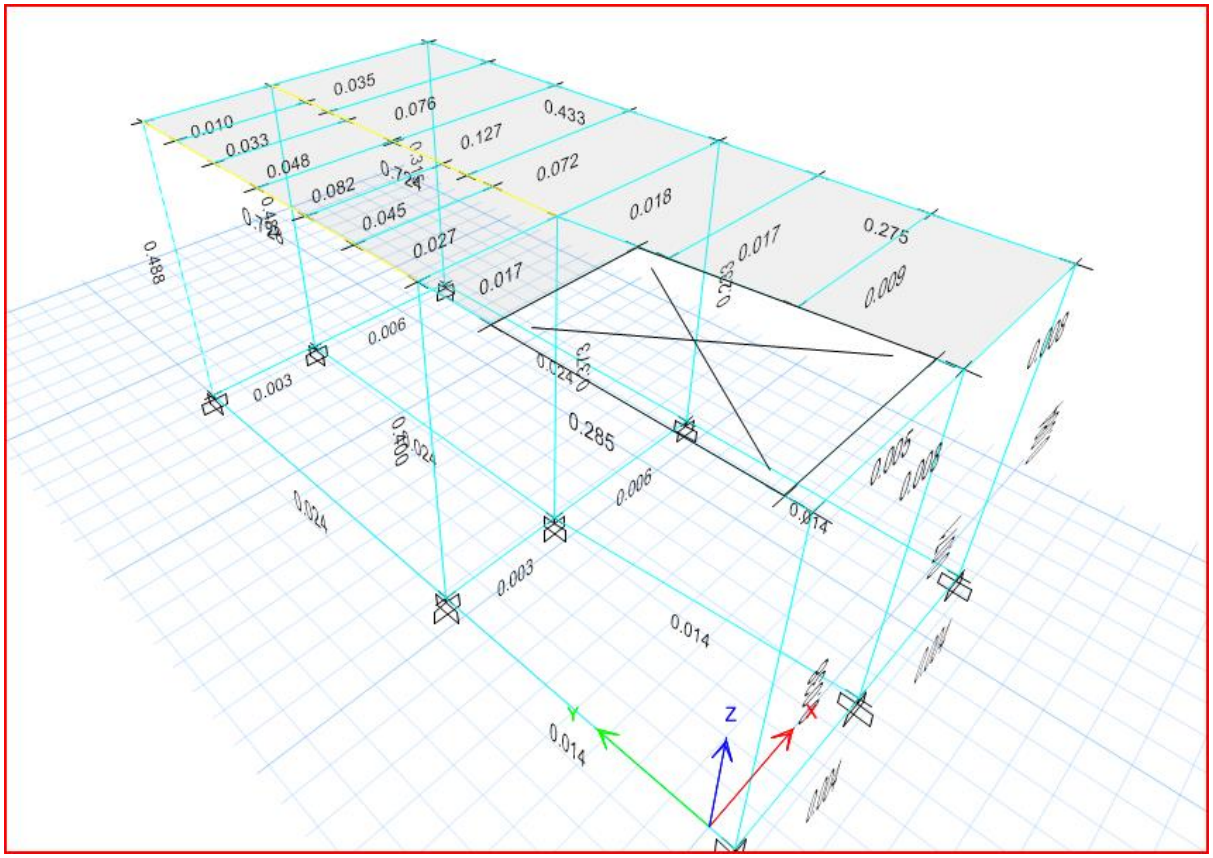


STRESS CHECK FOR COLUMN



RATIOS