



**TUGAS AKHIR - MO 141326**

**ANALISA PENGARUH PENGGUNAAN *EXPANSION JOINT*  
TERHADAP TEGANGAN SISTEM PERPIPAAN *HEAT RECOVERY  
STEAM GENERATOR (HRSG)***

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STRESS ANALYSIS OF EXPANSION JOINT USE ON HEAT  
RECOVERY STEAM GENERATOR'S PIPING SYSTEM

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**LEMBAR PENGESAHAN**

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(HRSG)**

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Diajukan untuk Memenuhi Salah Satu Syarat Memperoleh Gelar Sarjana Teknik pada  
Program Studi S-1 Departemen Teknik Kelautan, Fakultas Teknologi Kelautan, Institut  
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**ANALISA PENGARUH PENGGUNAAN *EXPANSION JOINT* TERHADAP  
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*GENERATOR (HRSG)***

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**ABSTRAK**

Tiap tahunnya kebutuhan listrik di Indonesia semakin naik, sehingga dibutuhkan tambahan pasokan listrik untuk memenuhi kebutuhan tersebut. Selain dengan menambah jumlah pembangkit listrik, pasokan listrik juga dapat ditingkatkan menggunakan alat yang disebut *Heat Recovery Steam Generator (HRSG)*, alat ini bekerja dengan memanfaatkan gas buang dari Pembangkit Listrik Tenaga Gas (PLTG) yang masih memiliki temperatur tinggi untuk memanaskan air di dalam *tubes*, uap hasil pemanasan air di HRSG digunakan untuk memutar *steam turbine*, yang kemudian diubah menjadi energi listrik.

HRSG memiliki sistem perpipaan yang digunakan sebagai sarana transportasi fluida di dalamnya. Sebagai sarana transportasi fluida, sistem perpipaan HRSG memiliki peran yang penting, sehingga harus dipastikan keamanannya. Salah satu parameter keamanan sistem perpipaan adalah tegangan yang bekerja pada pipa. Tegangan pada sistem perpipaan dipengaruhi oleh banyak hal, misalnya *pressure*, *temperature*, fleksibilitas pipa, dan lainnya. Salah satu cara menaikkan fleksibilitas pipa adalah dengan mengubah *layout* pipa, namun hal ini terkadang dibatasi oleh sedikitnya *space* yang tersedia, maka dari itu digunakan *item* yang memiliki fleksibilitas tinggi yang disebut *expansion joint*.

Pada Tugas Akhir ini dilakukan analisa pengaruh penggunaan *expansion joint* terhadap tegangan pipa yang berada di *Heat Recovery Steam Generator* milik PT X, analisa dilakukan dengan variasi kondisi *operating* dan *hydrotest*, ketebalan pipa juga divariasikan berkurang dikarenakan korosi yang terjadi pada pipa selama beroperasi. Dari hasil akhir penelitian didapatkan jika tegangan pipa pada kondisi *hydrotest* lebih tinggi dari tegangan pipa pada *operating condition*, penggunaan *expansion joint* mengurangi *displacement stress* yang terjadi pada pipa, serta tegangan pada pipa semakin tinggi seiring berkurangnya ketebalan pipa, kecuali pada *displacement stress* yang justru menurun.

*Kata kunci : PLTGU, HRSG, Piping System, Expansion Joint, Tegangan, ASME B31.1, AutoPIPE*

# **STRESS ANALYSIS OF EXPANSION JOINT USE ON HEAT RECOVERY STEAM GENERATOR'S PIPING SYSTEM**

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## **ABSTRACT**

Each year the electricity demand in Indonesia is increasing, so it needs additional supply of electricity to supply those needs. In addition to increasing the number of power plants, the power supply can also be upgraded using a tool called Heat Recovery Steam Generator (HRSG), this tool works by utilizing exhausted gas from Gas Power Plant (PLTG) which still has high temperature to heat the water in the tubes inside of HRSG, the heated water vapor at HRSG is used to rotate the steam turbine, which is then converted into electrical energy.

HRSG has a piping system used as a means of fluid transport in it. As a means of fluid transport, the HRSG piping system has an important role, so it must be ensured its safety. One of the security parameters of the piping system is the voltage acting on the pipe. The stress on the piping system is influenced by many things, such as pressure, temperature, pipe flexibility, and so on. One way to increase the flexibility of pipes is to change the layout of the pipes, but this is sometimes limited by the minimum available space, hence high flexibility items called expansion joints are used.

In this final project, the analysis of the effect of expansion joint exposure to pipe stresses in PT X's Heat Recovery Steam Generator, the analysis is done by the variation of operating and hydrotest conditions, the thickness of the pipe is also varied due to corrosion of the pipe during operation. From the final results of the study, the pipe stress on the hydrotest condition is higher than the pipe voltage in the operating condition, the use of the expansion joint reduces the stress on the pipe, and the tension on the pipe is higher as the pipe thickness decreases.

*Keywords : PLTGU, HRSG, Piping System, Expansion Joint, Tegangan, ASME B31.1, AutoPIPE*

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Tugas Akhir ini disusun guna memenuhi persyaratan dalam menyelesaikan Studi Kesarjanaan (S-1) di Departemen Teknik Kelautan, Fakultas Teknologi Kelautan (FTK), Institut Teknologi Sepuluh Nopember Surabaya (ITS). Tugas Akhir ini membahas tentang pengaruh penggunaan *expansion joint* terhadap tegangan sistem perpipaan di *Heat Recovery Steam Generator (HRSG)*, analisa tegangan dilakukan menggunakan *software* AutoPIPE.

Penulis sadar bahwa dalam pengerjaan dan penulisan Tugas Akhir ini masih jauh dari kesempurnaan sehingga kritik dan saran yang membangun sangat penulis harapkan agar kedepannya Penulis dapat membuat karya yang lebih baik. Akhir kata Penulis berharap penelitian ini dapat bermanfaat bagi segala pembaca pada umumnya dan Penulis pada khususnya.

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# BAB I

## PENDAHULUAN

### 1.1. Latar Belakang

Saat ini listrik menjadi salah satu kebutuhan pokok manusia, tiap tahunnya kebutuhan listrik di Indonesia semakin naik. Berdasarkan dokumen Rencana Strategis (Renstra) Direktorat Jenderal Ketenagalistrikan Kementerian Energi dan Sumber Daya Mineral Indonesia 2015 - 2019, pada awal periode Renstra 2010 - 2014, rasio elektrifikasi di Indonesia hanya sebesar 67,15% dan pada akhir tahun 2014 meningkat menjadi 84,35%. Rasio elektrifikasi di beberapa bagian di Indonesia dapat dilihat pada Gambar 1.1. Seiring kebutuhan listrik yang terus meningkat, maka Indonesia juga membutuhkan tambahan pasokan listrik. Selain dengan membangun pembangkit, pasokan listrik juga dapat ditambah dengan memaksimalkan kapasitas pembangkit listrik yang telah ada. Pada Gambar 1.1. dapat dilihat rasio elektrifikasi di Indonesia pada tahun 2014.



Gambar 0.1 Rasio Elektrifikasi di Indonesia Tahun 2014  
(Sumber: *Direktorat Jenderal Ketenagalistrikan, 2015*)

Di Indonesia sendiri telah banyak dibangun pembangkit listrik dengan berbagai macam sumber energi, salah satunya adalah PLTG (Pembangkit Listrik Tenaga Gas) yang memanfaatkan gas dengan suhu yang tinggi untuk menggerakkan turbin gas yang terhubung dengan generator sehingga dapat

menghasilkan energi listrik. Gas buang sisa penggunaan PLTG masih dapat dimanfaatkan untuk memanaskan air di dalam suatu alat bernama *Heat Recovery Steam Generator* (HRSG) karena masih memiliki suhu yang tinggi (sekitar 500°C). Dari proses pembakaran di dalam HRSG dihasilkan *steam* yang digunakan untuk menggerakkan *steam turbine*, sehingga dapat pembangkit dapat menghasilkan lebih banyak energi listrik. Dengan demikian dengan penggunaan HRSG didapatkan efisiensi thermal yang besar. Pada Gambar 1.2 dapat dilihat struktur dari *Heat Recovery Steam Generator* (HRSG).



Gambar 0.2 *Heat Recovery Steam Generator* (HRSG)  
(Sumber: *listrikindonesia.com*, 2013)

Pada HRSG terdapat banyak komponen yang memiliki fungsinya masing-masing, diantaranya adalah *inlet duct*, *deaerator*, *duct burner*, *stack*, sistem perpipaan, *casing*, SCR, dan lain sebagainya. Sebagai sarana transportasi fluida, sistem perpipaan HRSG memiliki peran yang penting, sehingga harus dipastikan keamanannya. Salah satu parameter keamanan sistem perpipaan adalah tegangan yang bekerja pada pipa. Tegangan pada sistem perpipaan dipengaruhi oleh banyak hal, misalnya *pressure*, *temperature*, fleksibilitas pipa, dan lainnya. Salah satu cara menaikkan fleksibilitas pipa adalah dengan mengubah *layout* pipa, namun hal ini terkadang dibatasi oleh sedikitnya *space* yang tersedia, maka dari itu digunakan *item* yang memiliki fleksibilitas tinggi yang disebut *expansion joint*. Pada Tugas Akhir ini dilakukan analisa pengaruh penggunaan *expansion joint* terhadap tegangan pipa yang berada di HRSG milik PT X, analisa dilakukan dengan variasi kondisi dan ketebalan pipa yang berkurang akibat terjadinya korosi.

## 1.2. Rumusan Masalah

Permasalahan yang akan diselesaikan dalam penelitian ini adalah:

1. Bagaimana pengaruh penggunaan *expansion joint* terhadap tegangan yang terjadi pada sistem perpipaan?
2. Bagaimana pengaruh korosi pada pipa terhadap tegangan yang terjadi pada sistem perpipaan?
3. Pada kondisi apakah sistem perpipaan mengalami tegangan paling besar?

## 1.3. Tujuan Penelitian

Tujuan yang akan dicapai dalam penelitian ini adalah:

1. Mengetahui pengaruh penggunaan *expansion joint* terhadap tegangan yang terjadi pada sistem perpipaan.
2. Mengetahui pengaruh korosi pada pipa terhadap tegangan yang terjadi pada sistem perpipaan.
3. Mengetahui kondisi sistem perpipaan yang mengalami tegangan paling besar.

## 1.4. Manfaat Penelitian

Manfaat penelitian dalam Tugas Akhir ini adalah:

1. Bagi Mahasiswa  
Menjadi sarana menambah ilmu pengetahuan tentang analisis tegangan yang terjadi pada sistem perpipaan.
2. Bagi Perguruan Tinggi  
Menjadi sumber informasi yang dapat dijadikan referensi bila ada penelitian serupa atau pun bila ada penelitian yang lebih lanjut.
3. Bagi Perusahaan  
Dapat dijadikan bahan evaluasi untuk desain sistem perpipaan HRSG yang ada di perusahaan.

## 1.5. Batasan Masalah

Adapun batasan masalah dari Tugas Akhir ini adalah sebagai berikut:

1. Analisa dilakukan dengan bantuan *software* AutoPIPE.
2. Analisa dilakukan pada *blowdown tank line pipe Heat Recovery Steam Generator* (HRSG) milik PT X.

3. *Code* yang digunakan dalam analisa ini adalah ASME B 31.1 *Power Piping*.
4. Analisa dilakukan pada *operating and hydrotest condition*.
5. Variasi ketebalan pipa dilakukan menggunakan data yang memiliki deviasi paling besar akibat terjadinya korosi.

#### **1.6. Sistematika Penulisan**

Sistematika penulisan yang digunakan dalam penyusunan Tugas Akhir ini terdiri dari lima bab sebagai berikut:

##### **BAB I PENDAHULUAN**

Pada bab ini penulis menjelaskan latar belakang permasalahan dari penelitian, persamaan masalah dari penelitian, tujuan dari penelitian, manfaat penelitian kedepannya dari penelitian yang akan dilakukan, batasan masalah dari penelitian, dan sistematika penulisan Tugas Akhir ini.

##### **BAB II TINJAUAN PUSTAKA DAN DASAR TEORI**

Pada bab ini penulis menjelaskan penelitian yang pernah dilakukan terdahulu, serta beberapa teori dasar yang mendukung penelitian pada Tugas Akhir ini.

##### **BAB III METODOLOGI PENULISAN**

Pada bab ini penulis menggambarkan sekaligus menjelaskan diagram alir dalam melakukan penelitian Tugas Akhir ini.

##### **BAB IV ANALISA HASIL DAN PEMBAHASAN**

Pada bab ini penulis menampilkan data dari *blowdown tank line pipe* di *Heat Recovery Steam Generator (HRSG) PT X* dan menjelaskan pemodelan *piping system* di *software AutoPIPE* beserta hasil analisa tegangan yang telah dilakukan.

##### **BAB V PENUTUP**

Bab ini berisi jawaban dari permasalahan Tugas Akhir serta berisi kesimpulan penelitian dan saran untuk penelitian akan datang.

## BAB II

### TINJAUAN PUSTAKA DAN DASAR TEORI

#### 2.1. Tinjauan Pustaka

Pada penelitian yang dilakukan Kurniawan (2008) dilakukan analisis integritas kekuatan sistem perpipaan pada *topside platform* di area Lima Laut Jawa menggunakan *software* perpipaan AutoPIPE 2004 berdasarkan kode ASME B31.3 *Piping Process*. Pada penelitian dilakukan analisis tegangan ultimate untuk menentukan sisa umur sistem perpipaan akibat pembebanan yang terus-menerus terjadi, baik akibat tekanan operasi, temperatur operasi dan juga akibat *subsidence* yang terjadi pada area tempat sistem perpipaan berada. Dari hasil analisis tegangan diketahui bahwa sistem perpipaan berada di kondisi kritis akibat fenomena *subsidence*, namun hal itu dapat diatasi dengan tindakan mitigasi berupa penambahan tumpuan pipa di dekat lokasi kritis.

Larastyawati (2014) melakukan analisa tegangan pada sistem perpipaan *Demineralized Water Treatment* pada beberapa mode operasi pompa pada *software* Caesar II 5.10, mode operasional pompa diterapkan dengan memvariasikan temperatur pada tiap segmen pipa. Setelah dianalisis ternyata diperlukan adanya modifikasi desain karena didapatkan gaya dan momen yang melebihi nilai *allowable loading nozzle* API 610. Dengan metode analysis didapatkan desain modifikasi dengan *expansion loop* aman terhadap getaran pompa, karena dapat mereduksi gaya dan momen pada *nozzle* pompa.

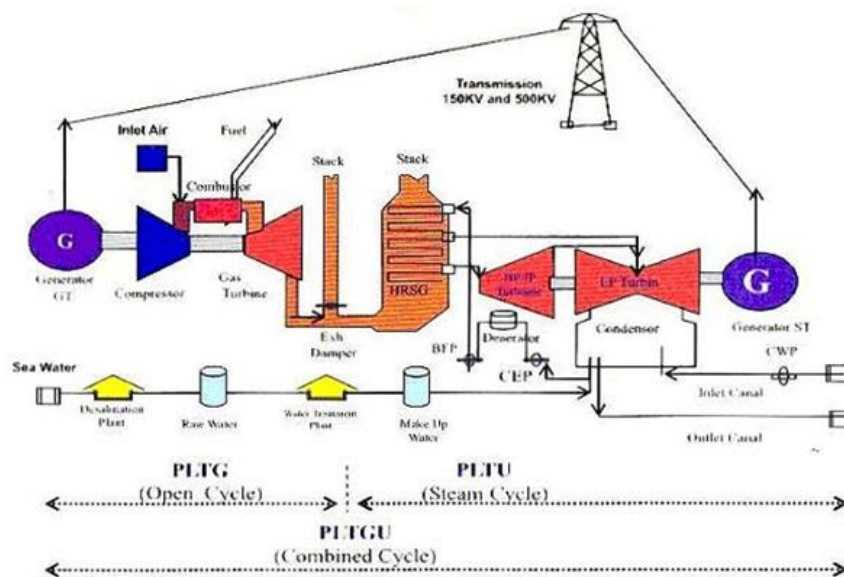
#### 2.2. Landasan Teori

##### 2.2.1. Pembangkit Listrik Tenaga Gas dan Uap (PLTGU)

PLTGU merupakan gabungan dari PLTG dan PLTU. Proses dari PLTG diawali dari *compressor* yang memompa udara ke ruang bakar, yang kemudian dibakar dengan bahan bakar gas alam. Hasil dari pembakaran tersebut adalah gas yang memiliki tekanan dan temperatur tinggi. Kemudian gas tersebut dialirkan untuk memutar turbin yang disalurkan dengan generator, maka saat turbin berputar maka generator juga berputar. Posisi kompresor juga seporos dengan turbin, jadi tekanan gas yang dihasilkan dari ruang bakar selain memutar turbin juga memutar kompresor yang kemudian dikonversikan menjadi energi listrik. Pada gas yang

telah melalui *gas turbine* tadi, dibuang ke atmosfer melalui *stack*. Gas yang dibuang biasanya masih bertemperatur tinggi, sekitar 500°C. Siklus pada PLTG ini biasa disebut *open cycle*.

PLTGU terdiri dari *turbine gas plant*, *Heat Recovery Steam Generator* (HRSG), dan *steam turbine plant*. PLTGU dibangun untuk memanfaatkan gas buang dari PLTG yang masih bertemperatur tinggi dengan bantuan suatu alat yang disebut *Heat Recovery Steam Generator* (HRSG), di dalam HRSG terdapat banyak *tubes* yang dialiri air, gas buang dari PLTG tersebut kemudian digunakan untuk membakar air di dalam HRSG dan mengubahnya menjadi uap yang kemudian digunakan untuk memutar *steam turbine*. Jadi pada PLTGU terdapat dua proses yang menghasilkan energi listrik, proses menggunakan *gas turbine* dan *steam turbine*. Siklus pada PLTGU biasa disebut *combine cycle*. Banyaknya energi listrik yang dihasilkan oleh PLTGU bergantung dari *exhaust gas* dari PLTG itu sendiri. Pada Gambar 2.1 dapat dilihat bahwa *open cycle* terdiri dari *compressor*, *combuster chamber*, *gas turbine*, *generator*. Kemudian setelah melalui *open cycle* gas buang dimasukkan ke HRSG lalu diproses sehingga dapat memutar *steam turbine*.



Gambar 2.3 *Open cycle and Combine Cycle*  
(Sumber: Djafar, 2013)

### 2.2.2. *Heat Recovery Steam Generator* (HRSG)

*Heat Recovery Steam Generator* atau yang sering disingkat HRSG adalah suatu komponen di *power plant* yang memanfaatkan energi panas dari gas buang

PLTG yang masih memiliki *temperature* tinggi untuk memanaskan air yang dialirkan melalui *tubes* sehingga akan menghasilkan uap yang digunakan untuk memutar *steam turbin*. Dengan demikian alat ini akan memberikan efisiensi termal yang besar. HRSG bekerja dengan mengalirkan gas buang bersuhu tinggi dari turbin gas ke dalam HRSG yang berisi *tubes*, sehingga air yang mengalir di dalam *tubes* berubah menjadi uap, air yang bercampur uap tersebut kemudian dialirkan menuju drum untuk dipisahkan antara air dan uap. Uap hasil dari pemanasan tersebut kemudian digunakan untuk memutar *steam turbin*, yang kemudian akan dikonversikan menjadi energi listrik.

Kapasitas produksi uap yang dihasilkan oleh HRSG bergantung pada besar energi panas yang diperoleh dari *exhaust gas* dari turbin gas. Tentunya besar kapasitas produksi uap HRSG juga berpengaruh pada besarnya kapasitas energi listrik yang dapat dihasilkan oleh PLTGU. Namun penggunaan HRSG sangat berpengaruh pada kapasitas pembangkit listrik, penggunaan HRSG dapat menambah kapasitas energi listrik hingga kurang lebih 30% - 50% dari kapasitas awal.

#### **2.2.2.1 Jenis HRSG Berdasarkan Sumber Panas**

##### ***Fired and Unfired***

Jika ditinjau dari sumber panasnya, terdapat dua jenis HRSG, yaitu HRSG *unfired* dan HRSG *fired (supplementary burner)*. HRSG *unfired* memperoleh sumber panasnya dari gas buang (*exhaust gas*) turbin gas PLTG, sedangkan HRSG *fired (supplementary burner)* merupakan HRSG yang menggunakan *burner* yang bertujuan untuk meningkatkan *temperature* dari *exhaust gas* PLTG.

#### **2.2.2.2. Jenis HRSG Berdasarkan Sumber Konstruksinya**

##### ***Horizontal Type***

HRSG tipe horizontal merupakan HRSG dengan aliran gas horizontal, sedangkan aliran airnya *natural circulation* sehingga tidak membutuhkan pompa, namun HRSG tipe ini membutuhkan area atau lahan yang cukup besar, dan ukuran *tubes* dengan OD lebih besar. HRSG ini memiliki *support* yang berada di *top* atau *bottom*.





Gambar 2.4 HRSG *Horizontal Type*  
(Sumber : *gepower.com*)

### ***Vertical Type***

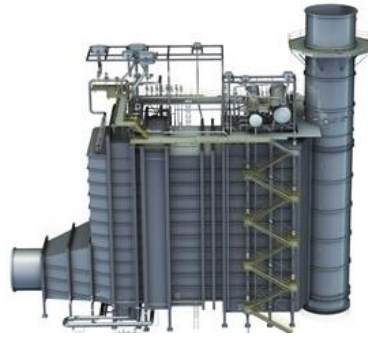
HRSG tipe vertikal merupakan HRSG dengan aliran gas vertikal, sedangkan aliran airnya *forced circulation* sehingga membutuhkan pompa, namun HRSG tipe ini membutuhkan area atau lahan yang sedikit, dan ukuran *tubes* dengan OD lebih kecil. HRSG ini memiliki *support* yang berada di *top*.



Gambar 2.5 HRSG *Vertical Type*  
(Sumber : *gepower.com*)

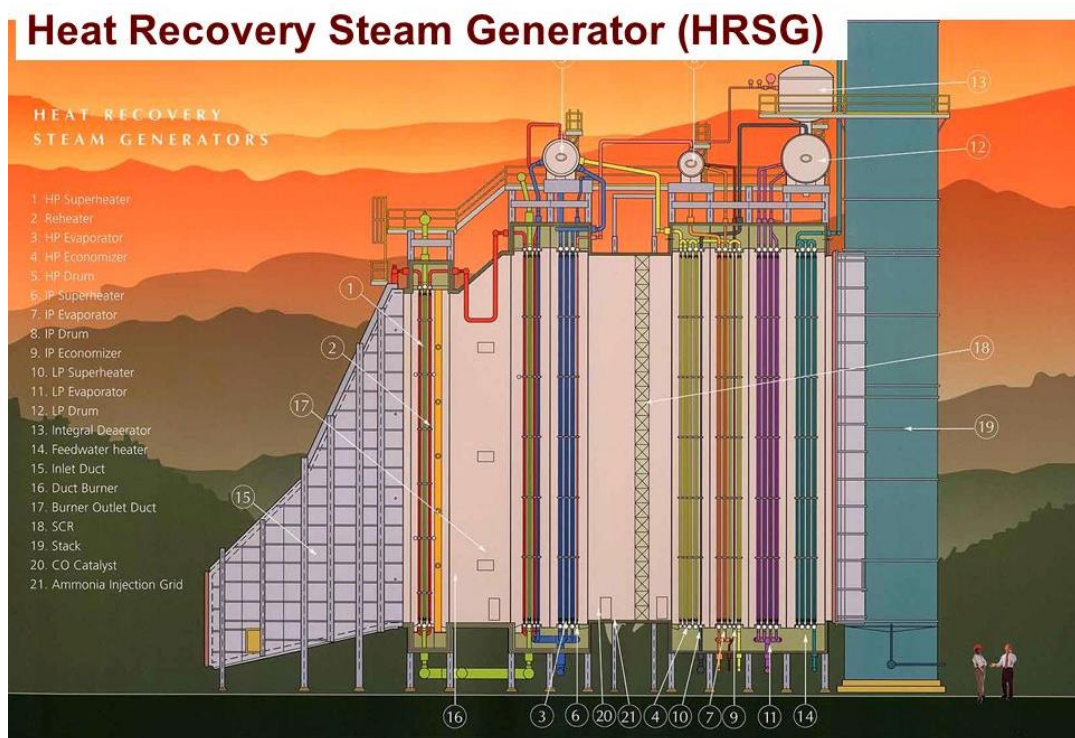
### ***Horizontal Once-Through***

HRSG tipe *horizontal once-through* merupakan HRSG dengan konsep sama seperti tipe horizontal hanya saja HRSG tipe ini tidak memiliki *drum* sehingga memungkinkan adanya *unlimited daily cycling*. Namun karena itu tipe HRSG ini membutuhkan material yang lebih tahan.



Gambar 2.6 HRSG *Horizontal Once-Through*  
(Sumber : *gepower.com*)

### 2.2.2.3. Bagian-Bagian HRSG



Gambar 2.7 Bagian HRSG  
(Sumber : *Shepard, 2015*)

HRSG terdiri dari beberapa bagian seperti pada gambar 2.5 di atas, yaitu :

#### 1. *Reheater/Preheater*

*Preheater* merupakan pemanas awal air yang dipompakan dari kondensator sebelum masuk feed water tank, yang bertujuan menaikkan suhu sebelum masuk *feed water tank*.

#### 2. *Economizer*

*Economizer* tersusun dari *tubes* di dalam HRSG yang berfungsi memanaskan air sebelum masuk ke *drum* dan *evaporator* sehingga temperature air telah tinggi

dan lebih mudah diuapkan. Selain itu, jika air yang masuk ke *economizer* lebih sedikit perbedaan temperaturnya, maka *tubes tubes economizer* tidak akan mudah rusak.

### 3. *Evaporator*

*Evaporator* bertugas memanaskan uap air yang berasal dari *steam drum* yang masih dalam fase cair hingga menjadi uap jenuh, yang kemudian akan diteruskan ke *superheater*.

### 4. *Superheater*

*Superheater* merupakan alat yang berfungsi untuk menaikkan temperatur uap jenuh sampai menjadi uap panas lanjut (*superheat vapour*). Uap panas lanjut bila digunakan untuk melakukan kerja dengan jalan ekspansi di dalam turbin atau mesin uap tidak akan mengembun.

### 5. *Steam Drum*

Fungsi utama dari *steam drum* di HRSG adalah untuk memisahkan fase cair dan fase uap/gas yang masing-masing memiliki perbedaan tekanan.

### 6. *Integral Daerator*

*Daerator* berfungsi menghilangkan oksigen dan CO<sub>2</sub> di *feedwater*, untuk memanaskan *feedwater*, dan sebagai storage untuk *daerated feedwater*.

### 7. *Feedwater Heater*

*Feedwater heater* berfungsi memanaskan *feedwater*.

### 8. *Inlet Duct*

*Inlet duct* berfungsi sebagai tempat masuknya *exhaust gas*.

### 9. *Duct Burner*

*Duct burner* merupakan alat yang berfungsi untuk menambah panas gas.

### 10. *SCR (Selective Catalytic Reducer)*

SCR berfungsi mengontrol emisi NO<sub>x</sub> and Sax.

### 11. *Stack*

*Stack* merupakan tempat keluarnya gas sisa pembakaran HRSG.

### 12. *CO Catalyst*

CO Catalyst berfungsi mengurangi emisi CO.

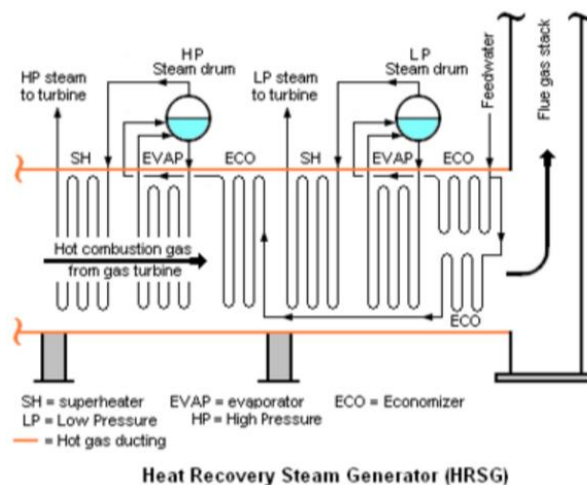
### 13. *Amonia Injection Grid*

*Amonia Injection Grid* berfungsi menghilangkan NO<sub>x</sub>.

#### 2.2.2.4. HRSG Flow Path Description

Daerated feedwater masuk ke HRSG melalui *tubes*, demikian juga *exhaust gas* dari PLTG masuk ke dalam HRSG melalui *inlet duct*. *Exhaust gas* memenuhi HRSG dan memanasi *tubes* yang berisi *daerated feedwater*. Setelah mengalami tahapan-tahapan di dalam HRSG maka akan dihasilkan *superheat vapour*, yang akan digunakan untuk menggerakkan turbin, kemudian dikonversikan ke energi listrik. Tahapan HRSG *flow path description* adalah sebagai berikut :

*HP Superheater 1 – Reheater 1 – HP Superheater 2 Reheater 2 – HP Superheater 3 – HP evaporator1 – HP Evaporator- IP Superheater – HP Economizer 1 – LP Superheater – HP Economizer 2 IP Evaporator - HP Economizer 3 – IP Economizer 1 – LP Evaporator – HP Economizer 4- Condensate Feedwater Preheater – Stack.*



Gambar 2.8 Pressure Part Diagram  
(Sumber : Citizendium, 2013)

#### 2.2.3. HRSG Piping System

*Piping system* pada HRSG dibedakan menjadi :

##### 1. Eksternal Piping

*Eksternal piping* merupakan *piping* yang berada di luar *casing* HRSG. Misalnya *piping* pada :

- *HP, IP, LP Steam*
- *HP, IP & LP Feedwater*
- *Hot, Cold Reheat*

##### 2. Interconnecting Piping

*Interconnecting piping* merupakan *piping* yang ada di *pressure parts* HRSG. Misalnya *piping system* pada :

- *HP, IP & LP Downcomer*
- *HP, IP, & LP Riser*

### 3. *Trim Piping*

*Trim piping* adalah *piping* dengan OD pipa kurang dari 2,5 *inch*. Misalnya *piping* pada :

- *Drain Pipes*
- *Fuel Pipes*
- *Spraywater Piping*

### 4. *Vent Piping*

*Vent piping* adalah *piping* yang menghubungkan ke *silencer*. Misalnya *piping* pada :

- *Safety Valve Vent Line*
- *Start Up Vent Line*

## 2.2.4. **Beban yang Bekerja pada Sistem Perpipaan**

Pada sistem perpipaan terdapat berbagai macam beban yang berbeda jenisnya, yaitu *sustained load*, *occasional load*, dan *expansion load*. Masing-masing beban berasal dari sumber yang berbeda, yang dapat diuraikan seperti di bawah ini :

### 2.2.4.1. *Sustained Load*

Beban *sustain* adalah beban yang bekerja terus menerus pada sistem perpipaan. Beban *sustain* berasal dari beban internal dan beban berat. Beban berat pada *piping system* dapat digolongkan sebagai berikut :

- *Live Load*

*Live load* yang dimaksudkan adalah beban *fluida* yang mengalir pada sistem perpipaan.

- *Dead Load*

*Dead load* yang dimaksud adalah beban dari komponen-komponen yang terdapat pada sistem perpipaan.

Beban berat yang bekerja pada sistem perpipaan akan disalurkan ke *pipe supports*. Sehingga pemodelan *pipe supports* juga merupakan hal penting, agar

dapat dipastikan *pipe supports* dapat menahan beban tersebut. Pemodelan *pipe supports* merupakan bagian dari analisis tegangan pada sistem perpipaan, *pipe supports* yang digunakan umumnya berjenis fixed sehingga tegangan maksimum yang dihasilkan dapat dilihat pada persamaan 2.1 berikut :

$$\sigma = \frac{WL^2}{8Z} \quad (2.1)$$

Dimana

$\sigma$  = tegangan (Pa)

W = berat *piping system* (N)

L = panjang pipa (m)

Z = inersia penampang pipa (m<sup>4</sup>)

#### 2.2.4.2. Occasional Load

Beban *occasional* adalah beban yang jarang terjadi, atau bisa juga diartikan beban yang terjadi hanya kadang-kadang, namun tetap harus diperhitungkan agar sistem perpipaan siap menerima beban tersebut saat beban tersebut terjadi. Beban yang digolongkan ke *occasional load* adalah beban yang terjadi hanya 1-10% dari total periode operasi sistem perpipaan. Yang termasuk *occasional loads* adalah sebagai berikut :

- Fenomena alam yang terjadi, seperti angin topan dan gempa bumi.
- Salju, pada saat turun salju, maka bagian-bagian tertentu pada sistem perpipaan yang terkena salju akan mengalami beban yang berlebih.
- *Unusual plant operation*, beban yang diakibatkan oleh kesalahan yang terjadi saat sistem perpipaan beroperasi.
- *Postulate plant accident*, beban yang diakibatkan apabila terjadi kecelakaan pada sistem perpipaan.

Untuk beban angin dapat dihitung menggunakan persamaan 2.2 berikut :

$$F = \frac{C_d D q}{1000} \quad (2.2)$$

Dimana

F = beban angin (N/m)

C<sub>d</sub> = koefisien drag

D = diameter luar pipa (mm)

q = tekanan dinamik (N/m<sup>2</sup>)

#### 2.2.4.3. Expansion Load

*Expansion load* adalah beban akibat ekspansi pipa yang disebabkan oleh adanya *thermal*. Beban ini dikelompokkan menjadi berikut ini :

- Beban ekspansi termal akibat pembatasan gerak oleh *pipe support*.
- Beban termal akibat perbedaan temperatur yang besar dan terjadi dengan cepat sehingga menimbulkan tegangan.
- Beban akibat perbedaan koefisien ekspansi pipa yang terdiri dari material logam yang berbeda.

*Pipe supports* digunakan untuk menahan beban *sustain* dan *occasional*, namun penggunaan *pipe supports* (terutama yang *rigid*) dapat membatasi ekspansi yang terjadi saat temperatur sistem perpipaan naik, sehingga dapat menimbulkan tegangan yang tinggi. Secara umum analisis perhitungan beban termal pada tumpuan menggunakan metode *guide cantilever*, dimana pipa dimodelkan sebagai batang yang dipegang secara rigid pada salah satu ujung, dan pada titik tertentu diberikan tumpuan sehingga dapat dihitung besar gaya pada tumpuan. Gaya dan momen yang terjadi dapat dilihat pada persamaan 2.3 dan 2.4 berikut :

$$P = \frac{12 E I \Delta}{L^3} \quad (2.3)$$

$$M = \frac{6 E I \Delta}{L^2} \quad (2.4)$$

Dimana

P = gaya pada tumpuan (N)

M = momen pada tumpuan (N/m)

E = modulus elastisitas (Pa)

I = momen inersia penampang (m<sup>4</sup>)

Δ = pertambahan panjang akibat ekspansi termal (m)

L = panjang pipa (m)

#### **2.2.4. Tegangan pada Sistem Perpipaan**

Tegangan pada sistem perpipaan terjadi karena beban-beban yang bekerja pada pipa yang telah dijelaskan sebelumnya. Analisa tegangan pada sistem perpipaan dilakukan untuk menjadin keamanan dari sistem tersebut dalam berbagai kondisi pembebanan, analisis dilakukan dengan memperhitungkan besaran-besaran yang diijinkan, seperti :

- Tegangan yang terjadi pada dinding pipa
- Perpindahan akibat ekspansi pipa

- Beban-beban pada *nozzle*

Tegangan yang terjadi dalam sistem perpipaan dapat dikelompokkan ke dalam dua kategori, yakni Tegangan Normal (*Normal Stress*) dan Tegangan Geser (*Shear Stress*). Tegangan normal terdiri dari tiga komponen yaitu :

1. Tegangan Longitudinal (*Longitudinal Stress*), yaitu tegangan yang searah panjang pipa.

Tegangan Longitudinal merupakan jumlah dari Tegangan Aksial (*Axial Stress*), Tegangan Tekuk (*Bending Stress*) dan Tegangan Tekanan (*Pressure Stress*). Mengenai ketiga tegangan ini dapat diuraikan berikut ini.

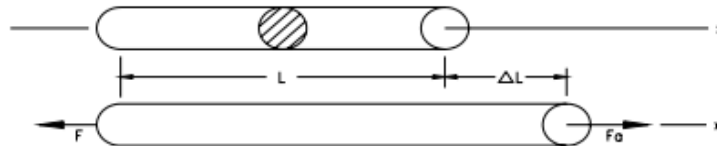
- a. Tegangan Aksial  $\sigma_{ax}$  adalah tegangan yang ditimbulkan oleh gaya  $F_{ax}$  yang bekerja searah dengan sumbu pipa, dan dapat dilihat pada persamaan 2.5 sebagai berikut:

$$\sigma_{ax} = \frac{F_{ax}}{A} \quad (2.5)$$

A = luas penampang pipa  $\left(\frac{d_o^2 - d_i^2}{4}\right)$

$d_o$  = diameter luar pipa

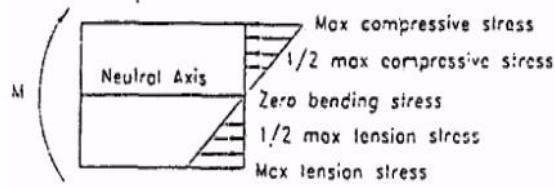
$d_i$  = diameter dalam pipa



Gambar 2.9 *Axial Stress*  
(Sumber : Chamsudi, 2005)

- b. Tegangan Tekuk ( $\sigma_b$ ) adalah tegangan yang ditimbulkan oleh momen M yang bekerja di ujung-ujung pipa. Dalam hal ini tegangan yang terjadi dapat berupa Tegangan Tekuk Tekan (*Tensile Bending*) atau Tegangan Tekuk Tarik (*Compression Bending*). Tegangan tekuk itu maksimum pada permukaan pipa dan nol pada sumbu pipa, karena tegangan tersebut merupakan fungsi jarak dari sumbu ke permukaan pipa, dapat dilihat pada persamaan 2.6 berikut.





Gambar 2.10 Tegangan Tekuk  
(Sumber : Chamsudi, 2005)

$$\sigma_b = \frac{M_c}{I} \quad (2.6)$$

$I$  = Momen Inersia Penampang  $\left(\frac{\pi (r_o^4 - r_i^4)}{4}\right)$

- c. Tegangan longitudinal tekan ( $\sigma_{LP}$ ) adalah tegangan yang ditimbulkan oleh gaya tekan internal  $P$  yang bekerja pada dinding pipa searah sumbu pipa, yang dilihat pada persamaan 2.7 berikut :

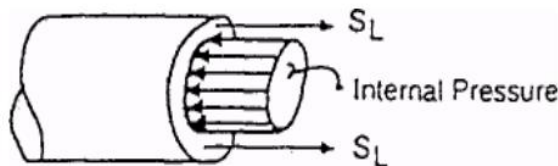
$$\sigma_{LP} = \frac{PA_i}{A_m} = \frac{Pd_i^2}{(d_o^2 - d_i^2)} = \frac{Pd_i^2}{4td_m} = \frac{Pd_o}{4t} \quad (2.7)$$

Dimana

$A_i$  = luas permukaan dalam pipa

$A_m$  = luas rata-rata permukaan pipa

$t$  = tebal pipa



Gambar 2.11 Tegangan Longitudinal Tekan  
(Sumber : Chamsudi, 2005)

Jadi tegangan longitudinal yang bekerja pada sistem perpipaan dapat dinyatakan dengan persamaan 2.8 di bawah ini.

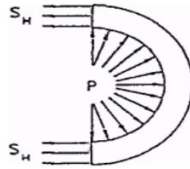
$$\sigma_{LP} = \frac{PA_i}{A_m} = \frac{Pd_i^2}{(d_o^2 - d_i^2)} = \frac{Pd_i^2}{4td_m} = \frac{Pd_o}{4t} \quad (2.8)$$

2. Tegangan Tangensial atau Tegangan Keliling (*Circumferential Stress* atau *Hoop Stress*).

*Hoop Stress* yaitu tegangan yang searah garis singgung penampang pipa. Tegangan tangensial  $\sigma_{SH}$  ditimbulkan oleh tekanan internal yang bekerja secara

tengensial dan besarnya bervariasi tergantung pada tebal dinding pipa. Rumus untuk tegangan tangensial dapat didekati dengan memakai persamaan Lamé 2.9 berikut.

$$\sigma_{LP} = \frac{P(r_1^2 + \frac{r_i^2 r_o^2}{r^2})}{(r_o^2 - r_i^2)} \quad (2.9)$$



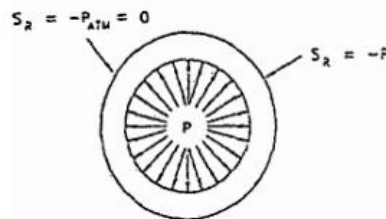
Gambar 2.12 *Hoop Stress*  
(Sumber Chamsudi, 2005)

### 3. Tegangan Radial (*Radial Stress*)

*Radial Stress* yaitu tegangan searah jari-jari penampang pipa. Besar tegangan ini bervariasi dari permukaan dalam pipa ke permukaan luarnya dan dapat dinyatakan dengan persamaan 2.10 berikut.

$$\sigma_R = \frac{P(r_i^2 - \frac{r_i^2 r_o^2}{r^2})}{(r_o^2 - r_i^2)} \quad (2.10)$$

Tekanan internal tegangan radial maksimum  $\sigma_{\max}$  terjadi pada permukaan dalam pipa dan tegangan minimum  $\sigma_{\min}$  pada permukaan luarnya. Kedua tegangan ini berlawanan dengan tegangan tekuk, sehingga tegangan radial tersebut sangat kecil dibandingkan dengan tegangan tekuk. Jadi tegangan radial dapat diabaikan.



Gambar 2.13 *Radial Stress*  
(Sumber : Chamsudi, 2005)

Untuk dinding pipa yang tipis persamaan di atas dapat disederhanakan menjadi persamaan 2.11 berikut.

$$\sigma_{SH} = \frac{Pd_iL}{2tL} = \frac{Pd_i}{2t} = \frac{Pd_o}{2t} \quad (2.11)$$

Tegangan Geser terdiri dari dua komponen tegangan, yaitu :

1. Tegangan Geser (*Shear Stress*).

Tegangan akibat gaya geser ini yang bekerja kearah penampang pipa dinyatakan dalam persamaan 2.12 berikut.

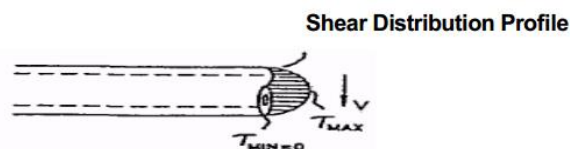
$$\sigma_{max} = \frac{VQ}{A_{max}} \quad (2.12)$$

Dimana

V = gaya geser

A<sub>max</sub> = luas penampang pipa

Q = *form factor* untuk pergeseran (1.33 untuk penampang lingkaran pejal)



Gambar 2.12 *Shear Stress*  
(Sumber : Chamsudi, 2005)

Tegangan geser mencapai nilai maksimum pada sumbu pipa dan minimum pada jarak terjauh dari sumbu pipa (yaitu permukaan luar pipa). Seperti halnya pada tegangan radial, besar tegangan geser ini kebalikan dengan tegangan tekuk, sehingga tegangan geser relatif kecil dibandingkan dengan tegangan tekuk, sehingga dapat diabaikan.

2. Tegangan Puntir atau Tegangan Torsi (*Torsional Stress*), yaitu tegangan akibat momen puntir pada pipa.

Suatu bentangan bahan dengan luas permukaan tetap dikenahi suatu puntiran (*twisting*) pada setiap ujungnya dan puntiran ini disebut juga dengan torsional, dan bentangan benda tersebut dikatakan sebagai poros (*shaft*). Untuk suatu poros dengan panjang L dan jari-jari c dikenahi torsi T (sepasang), sebagaimana ditunjukkan dalam gambar 2.13, Pergeseran sudut (*angular displacement*) ujung satu terhadap yang lainnya diberikan dengan sudut  $\phi$  (dalam radian) dapat dinyatakan seperti pada persamaan 2.13.

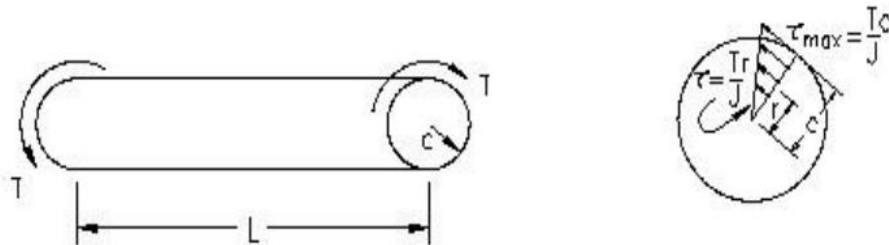
$$\phi = \frac{TL}{JG} \quad (2.13)$$

Dengan  $J = \pi c^4 2$  adalah *moment inersia polar* pada luas permukaan. Tegangan geser torsional pada suatu jarak  $r$  dari sumbu poros luas permukaan dapat dinyatakan dengan persamaan 2.14 berikut.

$$\tau = \frac{Tr}{J} \quad (2.14)$$

Maksimum tegangan geser yang terjadi pada  $r = c$  dapat dilihat pada persamaan 2.15.

$$J = \frac{\pi(c_o^2 - c_i^2)}{2} \quad (2.15)$$



Gambar Tegangan Geser Torsional  
(Sumber : Chamsudi, 2005)

Dari kelima macam tegangan yang terjadi di atas dapat disimpulkan bahwa apabila ada beban luar maupun internal pressure yang bekerja pada system perpipaan, maka pada system perpipaan tersebut akan mengalami tiga macam tegangan yang patut dipertimbangkan, yaitu tegangan longitudinal, tegangan shear torsional dan hoop stress dan dua macam tegangan yang diabaikan yaitu tegangan radial dan tegangan geser.

### 2.2.5. Pipe Supports

Dalam *pipe stress analysis*, didesain *pipe supports* yang sesuai agar *stress* dan *allowable stress piping* tidak melebihi batas yang ditentukan. Adapun dalam *software* AutoPIPE terdapat beberapa jenis *pipe support* seperti berikut ini :

#### a. V-stop

*Rigid support* yang hanya menahan arah vertikal saja. Contohnya : *short rod hanger assemblies (eye sockets, clevises, yokes, clamps, dll), pipe stanchions* dan

*trunnions, saddles, dan short structural steel sections.*

*b. Inclined*

*Support yang menahan beban secara miring. Contoh: wires, sway braces, dan struts.*

*c. Line Stop*

*Support yang hanya menahan pergerakan arah aksial pipa. Contoh: Pipe slides dengan limit stops, dan pipe skirts.*

*d. Guide*

*Support yang hanya menahan pergerakan pipa arah lateral (vertikal dan/atau horizontal). Contoh: pipe guides, roller chairs dan plates, saddles,.*

*e. Rotation*

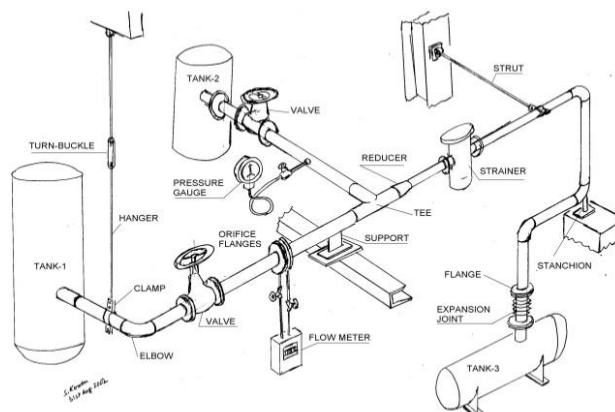
*Support yang hanya menahan pergerakan rotasi/berputar/ dari pipa. Contoh: sleeve pipa yang terbuat dari pipa yang lebih besar (menahan rotasi arah perpendicular pipa).*

*f. Damper*

Tipe *support* ini menahan getaran seismik, tidak menahan beban karena efek gravitasi atau kondisi operasi.

*g. Tie/link*

*Support yang menghubungkan antara dua pipa, atau menghubungkan pipa dengan frame. Contoh: rod hanger assemblies, sway braces, dan restricting struts.*



Gambar 2.14 Beberapa Tipe *Pipe Supports*  
(Sumber : [www.slideshare.net/](http://www.slideshare.net/))

### 2.2.6. Tegangan Ijin ASME B31.1

Tegangan sistem perpipaan tidak boleh melebihi tegangan ijin *code* yang digunakan. Pada kasus ini digunakan ASME B31.1 *Power Piping*, karena sistem

yang dianalisa terdapat di *power generating stations*. Tegangan yang ijin yang digunakan untuk desain *power piping system* dapat dilihat pada tabel lampiran A di ASME B31.1 atau yang disebut Tabel Tegangan Ijin.

- **Tegangan Akibat Beban *Sustain***

Tegangan yang terjadi akibat beban *sustain* seperti tekanan, berat, dan yang lainnya. Dapat dinyatakan dalam persamaan 2.16 dan 2.17 berikut :

(*U.S. Customary Units*)

$$\left(\frac{PD_0}{4t_n}\right) + \left(\frac{0.75iMa}{Z}\right) \leq 1.0 s_h \quad (2.16)$$

(*SI Units*)

$$\left(\frac{PD_0}{4t_n}\right) + \left(\frac{0.75iMa}{Z}\right) \leq 1.0 s_h \quad (2.17)$$

Dimana

$i$  = *stress intensification factor*

$M_A$  = *resultant moment loading on cross section due to weight and other sustained loads, in-lb (mm-N)*

$S_h$  = *basic material allowable stress at maximum (hot) temperature*

$S_L$  = *sum of the longitudinal stresses due to pressure, weight, other sustained loads*

$Z$  = *section modulus, in.<sup>3</sup> (mm<sup>3</sup>)*

- **Tegangan Akibat Beban *Occasional***

Tegangan yang terjadi akibat adanya kombinasi tekanan, berat, beban *sustain* yang lain, dan beban *occasional* termasuk gempa dapat dinyatakan dalam persamaan dibawah ini :

(*U.S. Customary Units*)

$$\left(\frac{PD_0}{4t_n}\right) + \left(\frac{0.75iMa}{Z}\right) + \left(\frac{0.75iMb}{Z}\right) \leq K s_h \quad (2.18)$$

(*SI Units*)

$$\left(\frac{PD_0}{4t_n}\right) + 1000 \left(\frac{0.75iMa}{Z}\right) + 1000 \left(\frac{0.75iMb}{Z}\right) \leq K s_h \quad (2.19)$$

Dimana

$k = 1.15$  for occasional loads acting for no more than 8 hr at any one time and no more than 800 hr/yr

$k = 1.2$  for occasional loads acting for no more than 1 hr at any one time and no more than 80 hr/yr

$M_g$  = resultant moment loading on the cross section due to occasional loads, such as thrusts from relief/safety valve loads, from pressure and flow transients, and earthquake, in.-lb (mm-N)

- **Tegangan Akibat Beban *Displacement***

Tegangan yang diakibatkan oleh *thermal expansion* dan beban siklik lainnya, dapat dinyatakan dalam persamaan :

$$S_E = \frac{iM_C}{Z} \leq S_A \quad (2.20)$$

Dimana

$M_C$  = resultant moment loading range on the cross section due to the reference displacement load range. For flexibility analyses, the resultant moment due to the ambient to normal operating load range and eq. (1A) are typically used, in.-lb (mm-N)

- ***Moments and Section Modulus***

Persamaan 2.16 – 2.20 digunakan untuk komponen yang lurus, pipa melengkung, siku yang dilas, dapat dihitung dengan persamaan 2.21 berikut :

$$M_j = (M_{xj}^2 + M_{yj}^2 + M_{zj}^2)^{1/2} \quad (2.21)$$

Dimana

$j = A, B, \text{ or } C$  seperti yang telah dijelaskan pada paragraf sebelumnya

$Z = \text{section modulus of piping, in.}^3 \text{ (mm}^3\text{)}$

### 2.2.7. ***Expansion Joint***

*Expansion joint* adalah alat yang digunakan untuk memungkinkan pergerakan dalam suatu sistem perpipaan ketika fluida yang melaluinya bertekanan

dan bersuhu tinggi. Kenaikan panas, pergerakan equipment, getaran, atau tekanan sering menyebabkan pergerakan dalam sistem perpipaan. Ketika fleksibilitas untuk meredam pergerakan tersebut tidak didesain ke sistem perpipaan, maka penggunaan expansion joint merupakan solusi ideal.

Dalam sistem perpipaan industri, *expansion joint* sering digunakan untuk mengakomodasi pergerakan akibat perubahan termal dan mekanik dalam sistem. Ketika terjadi suatu proses di dalam plant yang membutuhkan perubahan besar dalam suhu, maka komponen logam akan berubah dimensinya karena pemuaiian. Expansion joint dengan bellow dirancang untuk mengakomodasi gerakan tertentu dan meminimalkan transfer gaya dari komponen-komponen sensitif dalam sistem.

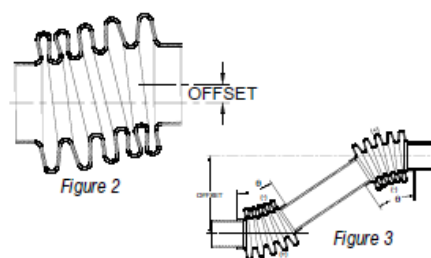
Ada empat pergerakan dasar yang dapat diterapkan pada sebuah *bellow*, yaitu aksial, *lateral*, *angular* dan *torsional*. *Bellow* berperilaku seperti spring dalam sistem perpipaan. Ketika bellow mendapat tekanan maka akan menahan gerakan yang sama seperti spring. *Spring rate* sebuah bellow sepenuhnya tergantung pada geometri *bellow* dan sifat materialnya

- Gerakan aksial adalah perubahan dalam dimensi panjang bellow dari panjang bebas dalam arah sejajar dengan sumbu *longitudinal*.



Gambar 2.15 Gerakan Aksial Bellow  
(Sumber : Expansion Joints Technical Design Catalog, 2001)

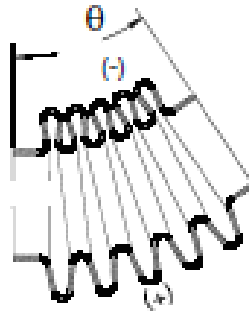
- Gerakan lateral adalah perpindahan relatif dari satu ujung ke ujung *bellow* lain dalam arah tegak lurus terhadap sumbu longitudinal (geser).





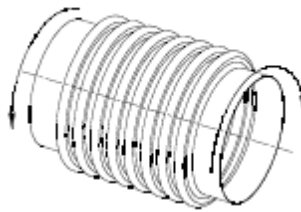
Gambar 2.16 Gerakan *Lateral Bellow*  
(Sumber : Expansion Joints Technical Design Catalog, 2001)

- Gerakan angular adalah perpindahan rotasi dari sumbu longitudinal bellow menuju titik rotasi.



Gambar 2.17 Gerakan *Angular Bellow*  
(Sumber : Expansion Joints Technical Design Catalog, 2001)

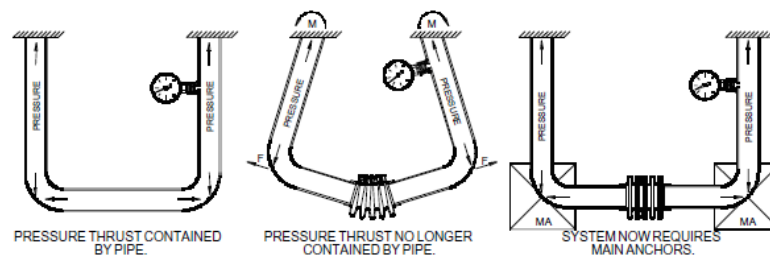
- Gerakan torsional adalah rotasi sumbu yang melalui pusat sebuah bellow



Gambar 2.18 Gerakan *Aksial Bellow*  
(Sumber : Expansion Joints Technical Design Catalog, 2001)

#### *Pressure Test*

Sistem perpipaan dibebani oleh *internal pressure*, maka dinding pipa akan mengalami *circumferential loading* dan *longitudinal loading*. Apabila di pipa dipasang *expansion joint*, maka gaya akibat *longitudinal pressure* harus ditahan oleh pipa. *Pressure thrust* adalah hasil dari *internal pressure* dikalikan dengan *Bellow effective area*. Bila tidak ada *anchor* untuk menyerap *pressure thrust*, maka bisa digunakan *tie rod* untuk menyerap *pressure thrust* tersebut. Tetapi perlu diingat bahwa *Bellow* yang diberi *Tie Rod* tidak bisa menyerap axial movement.



Gambar 2.19 *Pressure Thrust* pada Pipa  
(Sumber : Expansion Joints Technical Design Catalog, 2001)

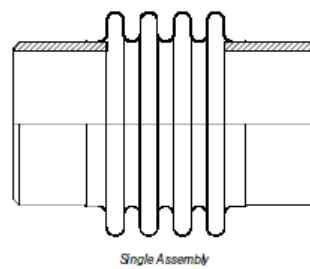
### *Basic Type of Expansion Joint*

#### *Unrestrained Assemblies*

*Expansion joint* jenis ini bebas bergeser sepanjang sumbu nya. Pressure thrust load akan didistribusikan kepada anchor. *Expansion joint* jenis ini harus menggunakan anchor pada instalasinya.

- *Single Bellows Assembly*

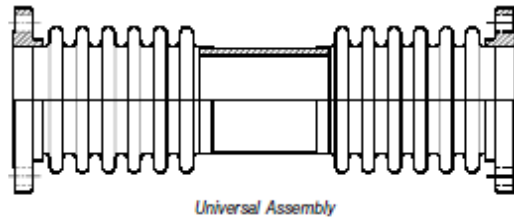
Merupakan tipe *expansion joint* yang paling sederhana yang memiliki *bellows* tunggal yang dilas pada bagian akhirnya biasanya pada bagian *flange* atau pada bagian akhir pipa. *Expansion joint* ini mampu menyerap pergerakan pada arah aksial, lateral dan angular baik secara sendiri-sendiri maupun kombinasi dari ketiga pergerakan tersebut dalam range pergerakan yang kecil.



Gambar 2.20 *Single Assembly*  
(Sumber : Expansion Joints Technical Design Catalog, 2001)

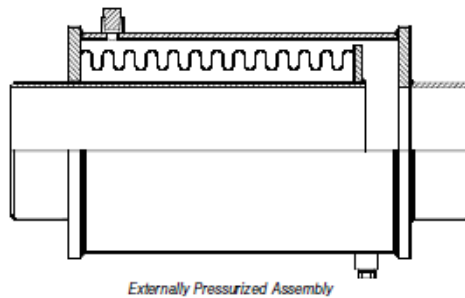
- *Universal Expansion Joint Assembly*

Memiliki dua *bellows* yang dihubungkan oleh sebuah *spool* pipa dengan *flange*. *Expansion joint* ini bisa menyerap pergerakan arah aksial, lateral dan angular dalam range pergerakan yang besar.



Gambar 2.21 *Universal Assembly*  
 (Sumber : Expansion Joints Technical Design Catalog, 2001)

- *Externally Pressurized Assembly*



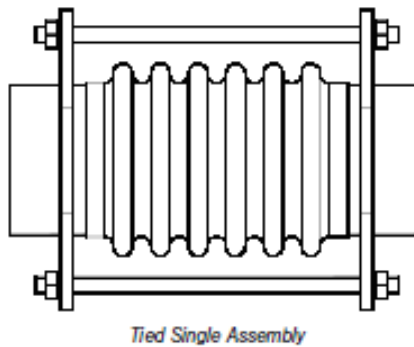
Gambar 2.22 *Externally Pressurized Assembly*  
 (Sumber : Expansion Joints Technical Design Catalog, 2001)

*Restrained Assemblies*

*Expansion joint* ini mampu menahan tekanan yang bekerja pada system. Dimana dibutuhkan *anchors* untuk mendistribukan gaya ketika *Expansion joint* dibelokan.

- *Tied Single Bellows Assembly*

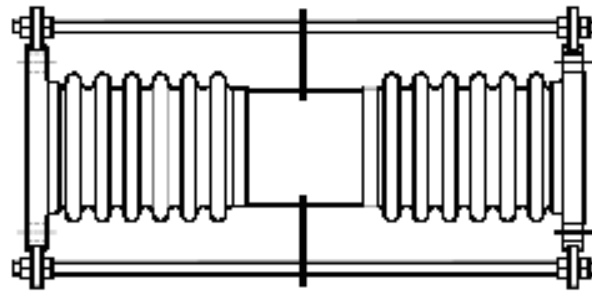
*Expansion joint* jenis ini hanya menyerap pergerakan pada arah lateral dalam range pergerakan yang kecil karena adanya tambahan *tie roads* yang di pasang pada pipa.



Gambar 2.23 *Tied Single Bellows Assembly*  
 (Sumber : Expansion Joints Technical Design Catalog, 2001)

- *Tied Universal Assembly*

*Tied Universal Expansion Joint* bisa mengakomodir pergerakan pada arah lateral dalam range yang cukup besar. Penambahan *tie rods* mengurangi kemampuan untuk menahan tekanan secara lateral dan angular.



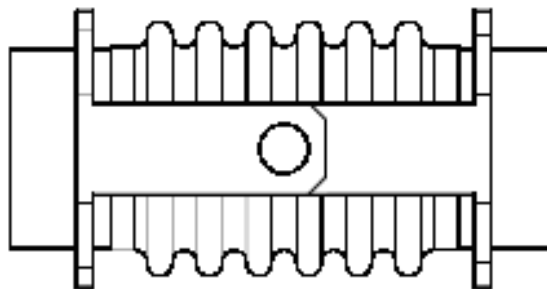
*Tied Universal Assembly*

Gambar 2.24 *Tied Universal Expansion*

(Sumber : Expansion Joints Technical Design Catalog, 2001)

- *Hinged Bellows Assembly*

*Expansion Joint* jenis ini digunakan untuk menyerap rotasi angular hanya pada satu bidang saja. Hinges yang ada pada *Expansion Joint* ini berfungsi untuk menahan pressure thrust load dan beban luar lain seperti angin dan beban mati. Dalam penggunaannya, *Hinged Expansion Joint* bisa digunakan sekaligus 2 buah, guna menyerap movement yang besar



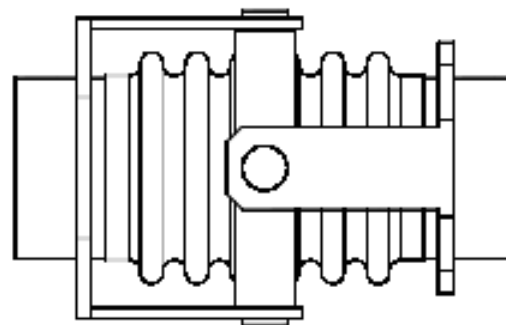
*Hinged Assembly*

Gambar 2.25 *Hinged Bellows Assembly*

(Sumber : Expansion Joints Technical Design Catalog, 2001)

- *Gimbal Bellows Assembly*

*Gimbal Expansion Joint* digunakan untuk meyerap pergerakan angular pada semua bidang/semua arah. *Hinge* dan *Gimbal ring* digunakan untuk menahan pressure thrust load dan beban luar lain seperti beban mati dan beban angin.



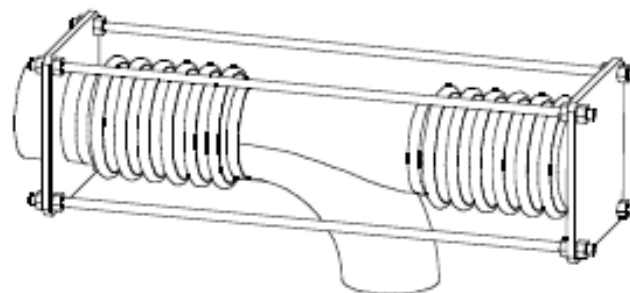
*Gimbal Assembly*

Gambar 2.26 *Gimbal Expansion Assembly*

(Sumber : Expansion Joints Technical Design Catalog, 2001)

- *Pressure Balanced Elbow Assembly*

*Expansion Joint* jenis ini mampu mengabsorb pergerakan arah axial dan lateral dan sekaligus mampu menahan pressure thrust load. *Expansion Joint* jenis ini hanya bisa digunakan pada bagian pipa yang mengalami perubahan arah (*elbow*)



*Pressure Balanced Elbow Assembly*

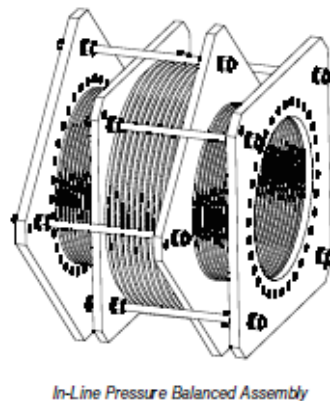
Gambar 2.27 *Pressure Balanced Elbow Assembly*

(Sumber : Expansion Joints Technical Design Catalog, 2001)

- *In-Line Pressure Balanced Assembly*

Pada *Expansion Joint* jenis ini, terdapat 2 jenis *bellow* , yaitu *Line Bellow* dan *Balancing bellow* yang berfungsi untuk

menyeimbangkan *bellow*. Bila *line bellow* terkompresi, maka untuk menyerap kompresi tersebut, *balancing bellow* akan berekspansi sejumlah pergerakan kompresi tersebut. Sehingga volume sepanjang *Expansion Joint* akan tetap sama dengan demikian pressure thrust load tidak akan terbentuk. *Expansion Joint* jenis ini digunakan pada pipa lurus dan terletak diantara 2 anchor guna mengkompensasi pergerakan axial dari pipa, *Expansion Joint* jenis ini juga dapat mengakomodasi sedikit pergerakan arah lateral.



Gambar 2.28 *In-Line Pressure Balanced Assembly*  
(Sumber : Expansion Joints Technical Design Catalog, 2001)

#### 2.2.8. Metode Elemen Hingga

Metode elemen hingga merupakan prosedur numerik yang dapat diterapkan untuk memperoleh solusi dari berbagai macam masalah dalam bidang keteknikan (Saeed Moaveni, 1999). Sehingga dapat diartikan jika metode elemen hingga merupakan pendekatan numerik yang digunakan untuk memperoleh solusi dari permasalahan teknik. Langkah pertama dalam menganalisa menggunakan metode elemen hingga adalah dikritisasi/*meshing* dan pemilihan jenis elemen, yaitu pemilihan jenis elemen berkaitan dengan idealisasi struktur yang dimodelkan. Pilihan berkaitan dengan jenis elemen (pilihan dimensi yang ada) lalu dilanjutkan tingkat kesulitan dari jenis elemen (ditunjukkan dengan jumlah titik yang ada di elemen dan jumlah derajat kebebasan dari masing-masing titik). Penentuan jumlah elemen berkaitan dengan ukuran elemen yang berpengaruh pada deformasi, regangan, serta tegangan yang akan terjadi pada struktur yang dimodelkan, tiap struktur memiliki bentuk geometri, beban, dan syarat batas.

Langkah kedua adalah memilih *displacement function* yang terkait dengan jumlah titik dalam satu elemen serta derajat kebebasan yang dimodelkan pada tiap titik atau derajat polinomial dalam asumsi fungsi deformasi dalam elemen tersebut. Langkah ketiga menentukan persamaan hubungan antara regangan dan deformasi, serta antara tegangan dan regangan. Persamaan regangan dan tegangan dapat dilihat pada persamaan 2.22 dan 2.23 berikut.

$$\text{Regangan : } \varepsilon_x = \frac{d_u}{d_x}, \varepsilon_y = \frac{d_v}{d_y}, \varepsilon_z = \frac{d_w}{d_z} \quad (2.22)$$

$$\text{Tegangan : } \sigma_x = E\varepsilon_x, \sigma_y = E\varepsilon_y, \sigma_z = E\varepsilon_z \quad (2.23)$$

Kemudian dilanjutkan dengan langkah keempat yaitu menentukan matrik persamaan dan kekakuan elemen. Terdapat tiga metode dalam penentuan persamaan kekakuan elemen :

- Metode Keseimbangan Langsung

Matrik persamaan elemen yang menunjukkan hubungan antara gaya, kekakuan, dan deformasi pada elemen ditentukan berdasarkan pada prinsip keseimbangan gaya.

- Metode Kerja

Pendekatan yang dapat mencakup hampir semua tingkat kerumitan suatu model seperti komponen material, dimensi, beban, dan syarat batas.

- Metode dengan Pemberatan pada Energi Sisa

Metode yang memberikan hasil yang sama untuk semua penyelesaian metode energi, metode ini sebagai penyelesaian saat metode energi tidak bisa digunakan, metode ini dapat mengadopsi langsung persamaan diferensial. Metode ini yang paling terkenal adalah metode Galerkin.

Persamaan elemen yang dihasilkan secara umum dapat dilihat pada persamaan 2.24 berikut.

$$\begin{Bmatrix} f_1 \\ f_2 \\ f_3 \\ \dots \\ f_n \end{Bmatrix} = \begin{bmatrix} k_{11} & \dots & k_{1n} \\ k_{21} & \dots & k_{2n} \\ k_{31} & \dots & k_{3n} \\ \dots & \dots & \dots \\ k_{n1} & \dots & k_{nn} \end{bmatrix} \begin{Bmatrix} d_1 \\ d_2 \\ d_3 \\ \dots \\ d_n \end{Bmatrix} \text{ atau } \{f\} = [k]\{d\} \quad (2.24)$$

Dimana

$\{f\}$  = matrik gaya

$[k]$  = matrik kekakuan

$\{d\}$  = matrik deformasi

Langkah kelima adalah penggabungan persamaan elemen pembentuk persamaan global atau total dari sistem dan menentukan syarat batas. Penggabungan persamaan elemen dilakukan dengan prinsip superposisi dengan mempergunakan prinsip kontinuitas dan kompatibilitas. Penyelesaian dari derajat kebebasan yang tak diketahui setelah syarat batas diberikan, persamaan dari sistem menjadi berikut.

$$\begin{Bmatrix} F_1 \\ F_2 \\ F_3 \\ \dots \\ F_n \end{Bmatrix} = \begin{bmatrix} K_{11} & \dots & K_{1n} \\ K_{21} & \dots & K_{2n} \\ K_{31} & \dots & K_{3n} \\ \dots & \dots & \dots \\ K_{n1} & \dots & K_{nn} \end{bmatrix} \begin{Bmatrix} d_1 \\ d_2 \\ d_3 \\ \dots \\ d_n \end{Bmatrix} \quad (2.25)$$

Dimana

$N$  = jumlah derajat kebebasan yang tak diketahui

Matrik  $[K]$  bersifat *non-singular* ( $\det[K] \neq 0$ )

Penyelesaian umumnya antara lain menggunakan metode eliminasi Gauss, Iterasi Gauss-Seidel, dan seterusnya. Langkah ketujuh adalah penyelesaian regangan dan tegangan elemen, hasil regangan dan tegangan adalah *output* yang umum digunakan untuk menentukan kualitas dari desain struktur. Langkah terakhir yaitu interpretasi hasil, *output* yang berupa deformasi, tegangan dan regangan adalah acuan dari penilaian model sehingga dari hasil analisa maka dapat ditentukan perubahan untuk perbaikan desain atau model.

Konsep analisis dengan metode elemen hingga banyak digunakan untuk beberapa *software* seperti AutoPIPE, ANSYS, Nastran, dan lain-lain. Proses analisis elemen hingga sendiri merupakan proses pendekatan numerik dengan membagi geometri menjadi beberapa elemen-elemen. Berikut adalah tahapan sederhana aplikasi metode elemen hingga pada *software*.

1. Pemodelan
2. Pendefinisian material
3. Pembagian menjadi beberapa elemen (*meshing*)



4. Memilih *boundary condition* (gaya, tekanan, *temperature*, percepatan, dan lain-lain)
5. *Post processing* atau hasil (tegangan, regangan, kecepatan fluida, laju aliran fluida, dan lain-lain).

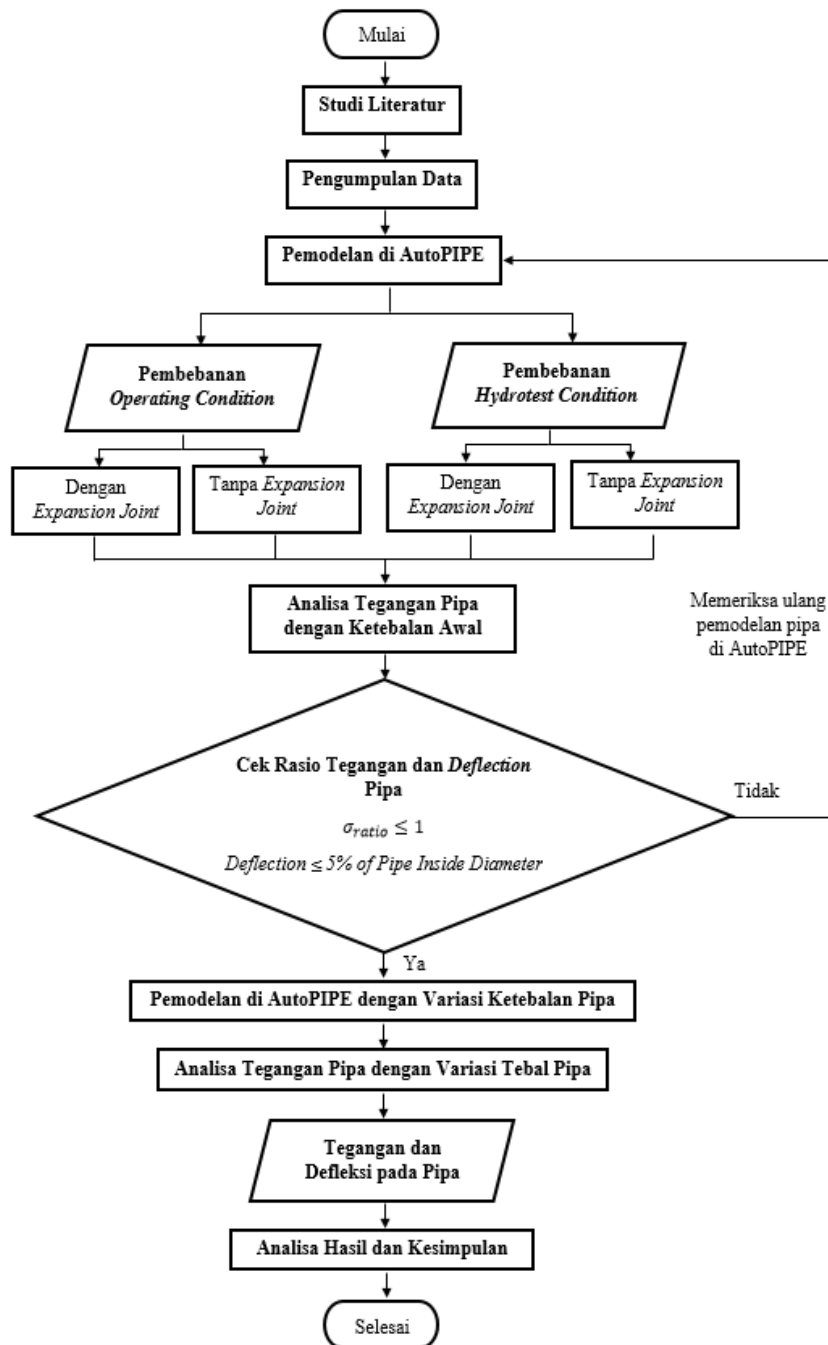
Seperti konsep metode elemen hingga yang telah dijelaskan, *software* AutoPIPE juga diawali dengan memodelkan sistem perpipaan yang akan dianalisa, kemudian penentuan material dan *boundary condition* dari sistem, sehingga dari analisa akan didapatkan tegangan, regangan, *deflection*, dan lain-lain.

## BAB III

### METODOLOGI PENELITIAN

#### 3.1 Diagram Alir Penelitian

Langkah-langkah pengerjaan Tugas Akhir ini secara garis besar dapat dilihat pada Gambar 3.1 berikut.



Gambar 3.1 Diagram Alir Pengerjaan Tugas Akhir

### 3.2 Prosedur Penelitian

Berdasarkan Gambar 3.1, prosedur yang digunakan dalam penelitian ini adalah sebagai berikut:

#### 1. Studi Literatur

Pada tahap ini dilakukan studi mengenai pengetahuan dan teori-teori yang berkaitan dengan *piping stress analysis* yang diperoleh dari berbagai penelitian yang telah dilakukan sebelumnya, buku, diktat, dan berbagai sumber internet.

#### 2. Pengumpulan Data

Pada tahap ini peneliti mengumpulkan data-data *blowdown tank line pipe* yang akan dianalisa. Data yang dibutuhkan adalah sebagai berikut :

- Gambar Isometrik
- Data Pipa
- Data Angin dan Seismik
- Data *Expansion Joint*

#### 3. Pemodelan di AutoPIPE

Pada tahap ini dilakukan pemodelan *blowdown tank line pipe* pada AutoPIPE sesuai dengan data yang desain awal, namun pada salah satu model dihilangkan *expansion joint*-nya untuk melihat hasil tegangan pada pipa yang tidak menggunakan *expansion joint*.

#### 4. Pembebanan

Pada tahap ini dilakukan *input* beban sesuai dua kondisi yaitu *operating condition* dan *hydrotest*.

#### 5. Analisa Tegangan Pipa dengan Ketebalan Awal

Pada tahap ini dilakukan analisa tegangan pada semua model yang telah dibuat di AutoPIPE.

#### 6. Cek Rasio Tegangan dan *Deflection*

Pada tahap ini dilakukan pengecekan rasio tegangan dan defleksi pipa, tegangan dan defleksi tidak boleh melebihi *allowable*.

#### 7. Pemodelan di AutoPIPE dengan Variasi Ketebalan Pipa

Pada tahap ini dilakukan pemodelan *blowdown tank line pipe* pada AutoPIPE sesuai dengan variasi tebal pipa dengan deviasi terbesar.

8. Analisa Tegangan Pipa dengan Variasi Tebal Pipa

Pada tahap ini dilakukan analisa tegangan pada semua model yang telah divariasikan ketebalannya.

9. Penutup

Pada tahap ini dilakukan pembahasan dari hasil analisa di *software* AutoPIPE untuk kemudian ditarik kesimpulannya.

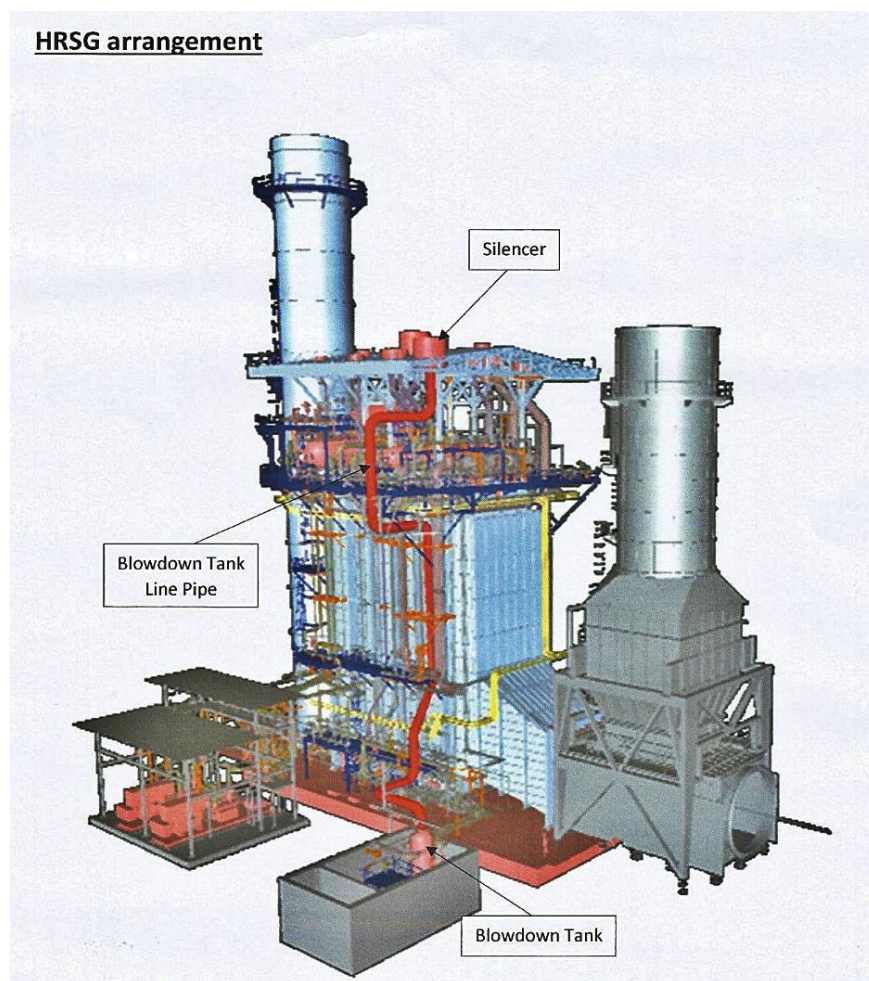
**(Halaman ini sengaja dikosongkan)**

## BAB IV

### ANALISIS DAN PEMBAHASAN

#### 4.1 Pengumpulan Data

Pada Tugas Akhir ini dilakukan analisa tegangan pada *blowdown tank line pipe* di *Heat Recovery Steam Generator* (HRSG) milik PT X. Posisi dan rute dari *blowdown tank line pipe* di HRSG dapat dilihat pada Gambar 4.1 berikut ini, bagian yang di-*high light* berwarna merah merupakan *blowdown tank line pipe*.



Gambar 4.1 *Heat Recovery Steam Generator* (HRSG) PT X

(Sumber : Dokumen PT X, 2017)

##### 4.1.1 *Piping Isometric Drawing*

*Piping isometric drawing* merupakan hal yang penting untuk menganalisa tegangan pada sistem perpipaan karena merepresentasikan *rooting* dari pipa yang



#### 4.1.2 Pipe Properties

Data *pipe properties* untuk *blowdown tank line pipe* HRSG PT X dapat dilihat pada Tabel 4.1 berikut.

Tabel 4.1 *Pipe Properties*

<i>Pipe Properties</i>		
Description	Nilai	Satuan
Nominal Pipe Size	650	mm
Pipe Schedule	9,525	mm

#### 4.1.3 Material Properties

Material yang digunakan adalah ASTM A 106 *Carbon Steel Pipe Grade B*. ASTM A106 pipe (also covered in ASME specifications as S/A 106) is the standard specification for seamless carbon steel pipe for high-temperature service. Dengan *wall thickness* 19,525 mm. Material ini memiliki *tensile strength* 60.000 psi atau 415 Mpa, dan *yield strength* 35.000 psi atau 240 Mpa.

#### 4.1.4 Corrosion Allowance

*Corrosion allowance* untuk *blowdown tank vent* milik PT X adalah 1,6 mm.

#### 4.1.5 Data Pembebanan pada Hydrotest Condition

*Hydrotest* dilakukan untuk menguji pipa terhadap tekanan yang melebihi dari tekanan saat kondisi operasi, pada saat tes ini pipa dialiri air. Data pada saat *operating condition* dapat dilihat pada Tabel 4.2 berikut.

Tabel 4.2 Data *Operating Condition*

<i>Description</i>		<i>Unit</i>
<i>Pressure</i>	1,5	N/mm <sup>2</sup>
<i>Temperature</i>	25	C
<i>Spesific Gravity</i>	1	
<i>Pipe Insulation</i>	0	mm

#### 4.1.6 Data Pembebanan pada Operating Condition

Setelah dilakukan *hydrotest*, sistem perpipaan akan beroperasi pada suhu dan temperature tertentu. Data pada saat *operating condition* dapat dilihat pada Tabel 4.3.



Tabel 4.3 Data *Operating Condition*

<i>Description</i>		<i>Unit</i>
<i>Pressure</i>	0,35	N/mm <sup>2</sup>
<i>Temperature</i>	304	C
<i>Spesific Gravity</i>	0,002	
<i>Pipe Insulation</i>	80	mm
<i>Insulation Density</i>	128	Kg/m <sup>3</sup>

#### 4.1.7 Data Beban Lingkungan

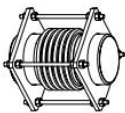
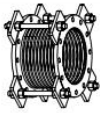

Dalam beroperasi atau saat sedang dilakukan *hydrottest* sistem perpipaan pasti menerima beban lingkungan (*occasional loads*). Data untuk *seismic* sebesar 0,24 G, sedangkan untuk data beban angin dapat dilihat pada Tabel 4.4.

Tabel 4.4 Data *Wind Loads*

Data Angin		
<i>Elevation 0 m</i>	648,21	N/m <sup>2</sup>
<i>Elevation 15 m</i>	889,95	N/m <sup>2</sup>
<i>Elevation 30 m</i>	984,39	N/m <sup>2</sup>
<i>Elevation 40 m</i>	1016,93	N/m <sup>2</sup>

#### 4.1.8 Data *Expansion Joint*

Pada *blowdown tank line pipe* digunakan *expansion joint* di dekat *anchor* sistem perpipaan, *expansion joint* yang digunakan adalah produk EJS dengan data yang dapat dilihat pada Gambar 4.3 berikut.

<b>FV/ 50 PSIG</b>	<b>SINGLE ASSEMBLY</b>											
		<b>ES-40010 WELD END W/ RODS</b>			<b>ES-40020 FLANGED W/RODS</b>							
<b>Nominal Size</b> Thrust Area	<b>Part Code</b>	<b>Movements</b> Axial Lateral Angular IN IN DEG			<b>Spring Rates</b> Axial Lateral Angular LBS/IN LBS/IN IN-LBS/DEG			<b>ES-40010</b> OAL TIED OAL WEIGHT IN IN LBS			<b>ES-40020</b> OAL* WEIGHT IN LBS	
<b>24</b> INCH 506 SQ. IN	<b>-241</b> <b>-242</b> <b>-243</b> <b>-244</b>	1.56 2.36 3.92 4.71	0.07 0.17 0.47 0.79	7.07 10 10 10	1222 813 488 602	89792 25957 5662 3509	1721 1145 688 848	9.13 11.00 14.63 18.38	15.63 19.25 25.88 31.13	57/304 61/328 69/370 84/403	6.13 8.00 11.63 15.38	200/333 206/354 216/382 233/417

- Notes:
1. Max Temperature - 800 deg F
  2. Movements are maximum non-concurrent. See page 65 for methods of combining movements.
  3. Maximum axial extension is 50% of rated axial movement.
  4. Rated cycle life is 3,000 EJMA cycles.
  5. Maximum test pressure is 1.5 times rated working pressure.
  6. Pressure thrust = Thrust Area X 50 psig.
  7. Refer to page 68 for torsional spring rates.
  8. TR option movement limitations: 8" and below, angular and lateral only. For 10" and above, only lateral movement.
  9. Refer to page 66 for flange dimensions and drilling.

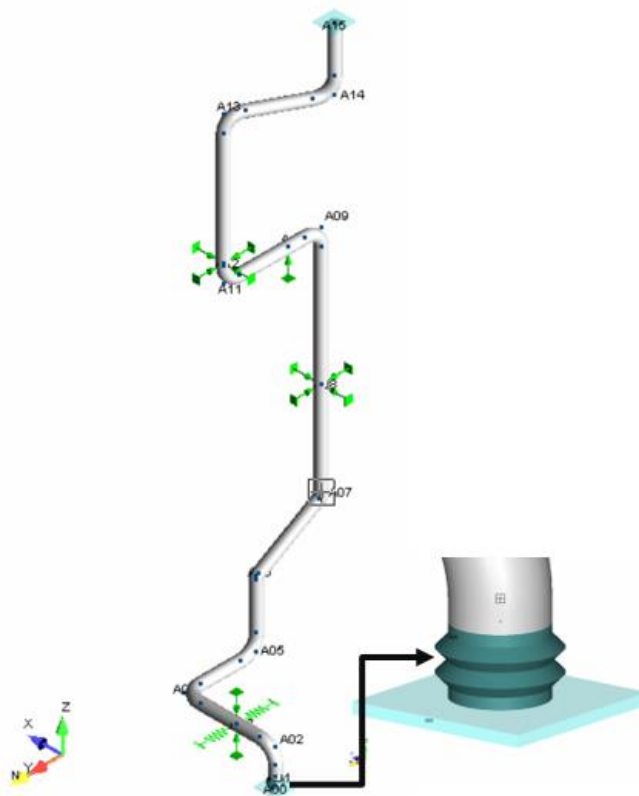
- Materials
- Bellows- A240-304/316/321
  - Pipe- A53 GR.B Sch. Std.
  - Flanges- Plate C.S. 150# Drilling
  - Liner- same as bellows (w/drain holes)\*
  - Cover- C.S.

\* Add 0.25" to OAL for vanstone option with liner.

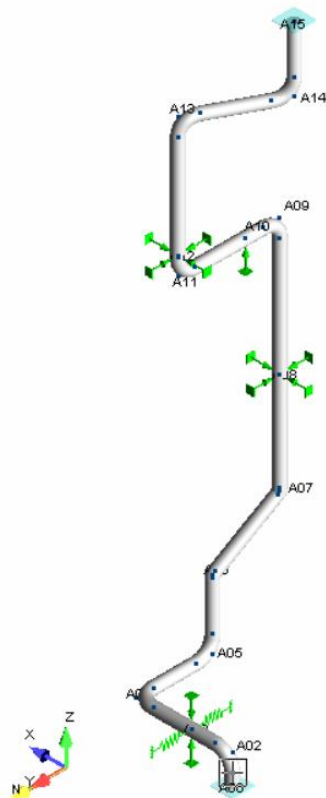
Gambar 4.3 Data *Expansion Joint* pada *Blowdown Tank Line Pipe* (Sumber : *Expansion Joints Technical Design Catalog*, 2001)

## 4.2 Pemodelan di AutoPIPE

Sebelum dilakukan analisa tegangan, perlu dilakukan pemodelan *line pipe* sesuai dengan *isometric drawing*-nya. Penulis memodelkan *blowdown tank line pipe* menggunakan *software* AutoPIPE. *Line pipe* yang dimodelkan menggunakan *anchor* di kedua ujungnya untuk mewakili *nozzle* dan *silencer* yang ada di ujung-ujungnya. Pemodelan dilakukan dengan memasukkan data *pipe properties* seperti *nominal diameter*, *schedule*, *corrosion allow*, *specific gravity*, *pipe material*, *insulation thickness and density*. Setelah memasukkan *pipe properties*, lalu dimasukkan *temperature dan pressure*, karena analisa dilakukan pada dua kondisi yaitu *operating* dan *hydrottest*, maka untuk *input temperature*, *pressure*, *pipe insulation*, dan *specific gravity* disesuaikan dengan data pada kondisi masing-masing. Setelah itu mulai dibuat pemodelan *line pipe* sesuai dengan *route*, *pipe supports*, *expansion joint* sesuai data. Hasil dari pemodelan *blowdown tank line pipe* yang sesuai dengan data (menggunakan *expansion joint*) pada AutoPIPE dapat dilihat pada Gambar 4.4, sedangkan untuk pemodelan *blowdown line pipe* setelah *expansion joint* dihilangkan dapat dilihat pada Gambar 4.5.



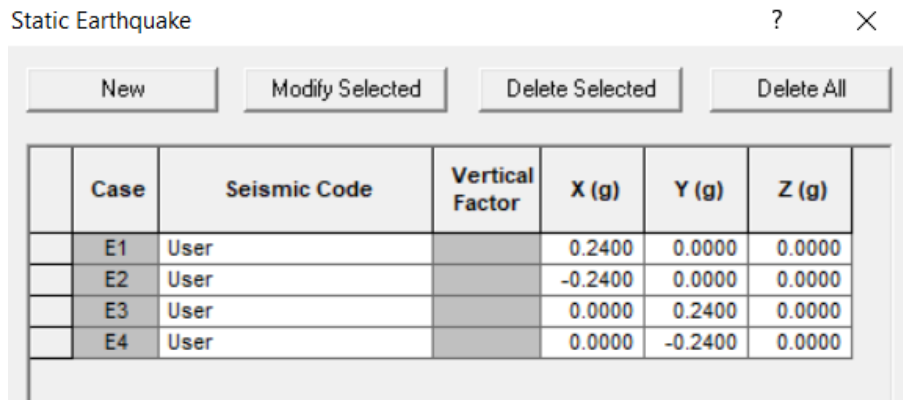
Gambar 4.4 Pemodelan *Blowdown Line Pipe* dengan *Expansion Joint*



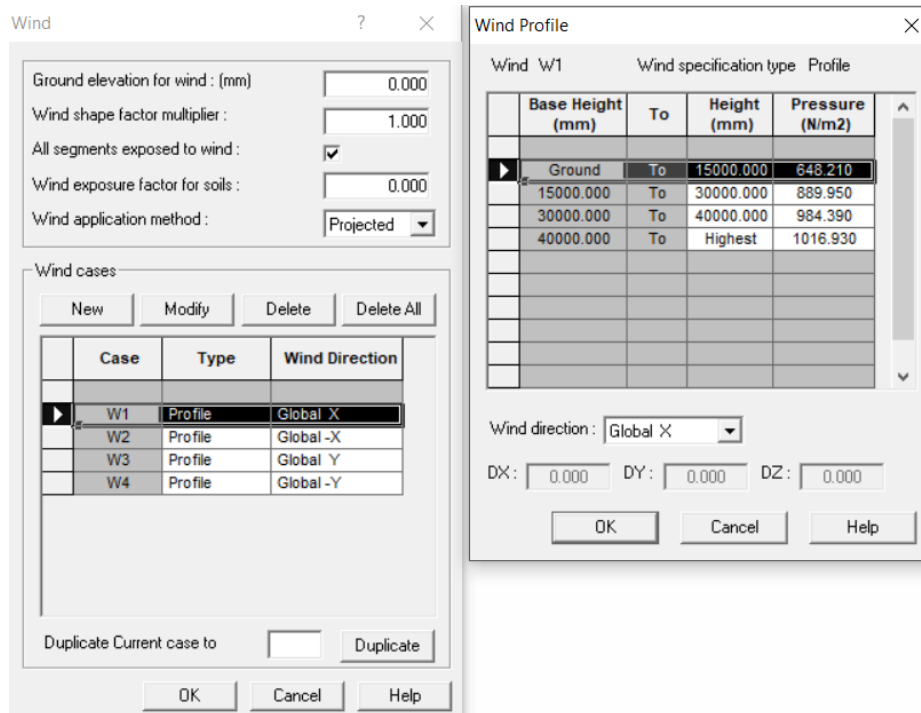
Gambar 4.5 Pemodelan *Blowdown Line Pipe* Tanpa *Expansion Joint*

### 4.3 Pembebanan

Pada analisa yang akan dilakukan juga turut diperhitungkan beban lingkungan, beban yang dimaksud adalah seismik dan beban angin. Beban seismik sebesar 0,24 g di-*input*-kan dengan variasi arah  $x$ ,  $-x$ ,  $y$ , dan  $-y$ , sedangkan untuk beban angin di-*input*-kan sesuai ketinggian dan tekanan angin dengan variasi arah  $x$ ,  $-x$ ,  $y$ , dan  $-y$ . Untuk lebih jelasnya dapat dilihat kotak dialog untuk memasukkan *seismic loads* (Gambar 4.6) dan kotak dialog untuk memasukkan *wind loads* (Gambar 4.7).



Gambar 4.6 Kotak Dialog *Static Earthquake*



Gambar 4.7 Kotak Dialog *Wind and Wind Profile*

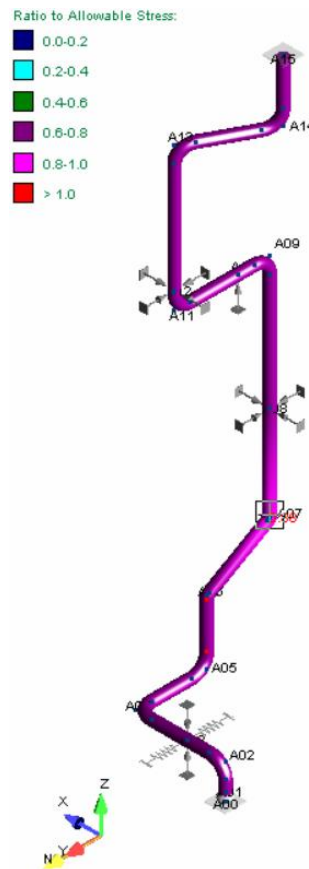
Setelah semua beban dimasukkan, maka dipilih *static analysis sets* untuk memilih beban-beban mana saja yang akan diberikan pada model *blowdown tank line pipe* untuk dianalisa tegangannya. Pada analisa Tugas Akhir ini *pressure*, *temperature*, dan semua *earthquake and wind cases* diberikan pada model di AutoPIPE, sehingga tegangan yang diakibatkan oleh kombinasi-kombinasi dari beban yang telah dipilih dapat dilihat di hasil analisis *software*.

#### 4.4 Analisa Tegangan Pipa dengan Ketebalan Awal

Hasil analisa tegangan didapatkan dari *stress analysis* pada model di AutoPIPE, berikut adalah hasil tegangan maksimal di *blowdown tank line pipe* pada *operating and hydrotest condition*.

##### 4.4.1. Tegangan pada *Hydrotest Condition* (Dengan *Expansion Joint*)

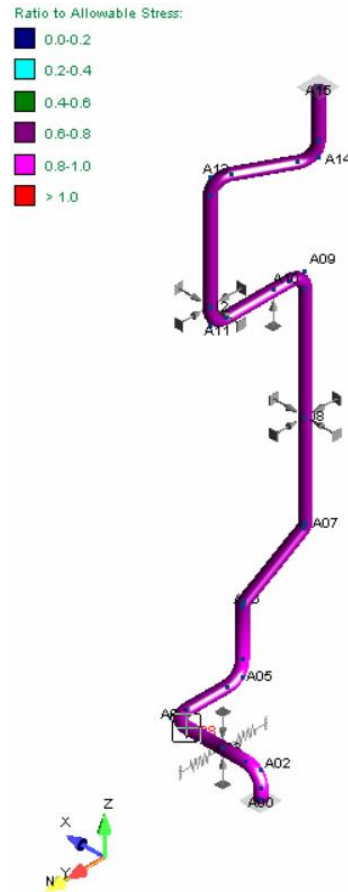
Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang menggunakan *expansion joint* pada *hydrotest condition*. Hasil analisa rasio tegangan dapat dilihat pada Gambar 4.8 berikut.



Gambar 4.8 Rasio Tegangan *Blowdown Tank Vent* pada *Hydrotest Condition* (Dengan *Expansion Joint*)

#### 4.4.2. Tegangan pada *Hydrotest Condition* (Tanpa *Expansion Joint*)

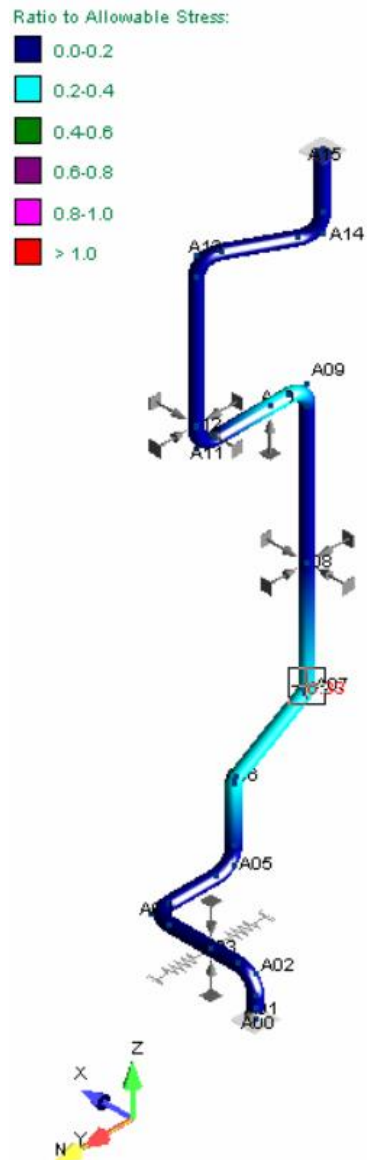
Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang tidak menggunakan *expansion joint* pada *hydrotest condition*. Hasil analisa tegangan dapat dilihat pada Gambar 4.9 berikut.



Gambar 4.9 Rasio Tegangan *Blowdown Tank Vent* pada *Hydrotest Condition* (Tanpa *Expansion Joint*)

#### 4.4.3. Tegangan pada *Operating Condition* (Dengan *Expansion Joint*)

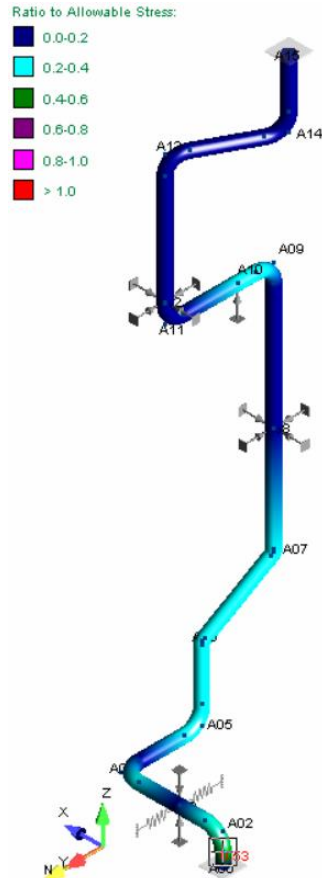
Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang menggunakan *expansion joint* pada *operating condition*. Hasil analisa tegangan dapat dilihat pada Gambar 4.10 berikut.



Gambar 4.10 Rasio Tegangan *Blowdown Tank Vent* pada *Operating Condition* (Dengan *Expansion Joint*)

#### 4.4.4. Tegangan Maksimal pada *Operating Condition* (Tanpa *Expansion Joint*)

Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang tidak menggunakan *expansion joint* pada *hydrotest condition*. Hasil analisa tegangan dapat dilihat pada Gambar 4.11 berikut.



Gambar 4.11 Tegangan *Blowdown Tank Vent* pada *Hydrotest Condition* (Tanpa *Expansion Joint*)

*Maximum sustained stress, allowable sustained stress, dan rasio sustained stress* hasil analisa pada bab 4.4.1 hingga bab 4.4.2 dapat dilihat pada Tabel 4.5 berikut.

Tabel 4.5 *Sustained Stress Blowdown Vent Pipe* pada Ketebalan Pipa Awal

<i>Sustained Stress (Hydrotest Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	104,19	117,90	0,88	GR + Max P{1}	A06 F	86,26	117,90	0,73	GR + Max P{1}
<i>Sustained Stress (Operating Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	39,1	117,90	0,33	GR + Max P{1}	A06 F	32	117,90	0,27	GR + Max P{1}



*Maximum displacement stress, allowable displacement stress, dan rasio displacement stress* hasil analisa pada bab 4.4.1 hingga bab 4.4.2 dapat dilihat pada Tabel 4.6 berikut.

Tabel 4.6 *Displacement Stress Blowdown Vent Pipe* pada Ketebalan Pipa Awal

<i>Displacement Stress (Hydrotest Condition)</i>									
Menggunakan <i>Expansion Joint</i>					Tanpa <i>Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A06 N	126,16	176,85	0,71	Max Range	A04 N	173,69	176,85	0,98	Max Range
<i>Displacement Stress (Operating Condition)</i>									
Menggunakan <i>Expansion Joint</i>					Tanpa <i>Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 N	5,08	176,85	0,03	Max Range	A02 N	94,43	176,85	0,53	Max Range

*Maximum occasional stress, allowable occasional stress, dan rasio occasional stress* hasil analisa pada bab 4.4.1 hingga bab 4.4.2 dapat dilihat pada Tabel 4.7 berikut.

Tabel 4.7 *Occasional Stress Blowdown Vent Pipe* pada Ketebalan Pipa Awal

<i>Occasional Stress (Hydrotest Condition)</i>									
Menggunakan <i>Expansion Joint</i>					Tanpa <i>Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	120,97	141,48	0,86	Sus. + E3{1}	A06 F	106,33	141,48	0,75	Sus. + E1{1}
<i>Occasional Stress (Operating Condition)</i>									
Menggunakan <i>Expansion Joint</i>					Tanpa <i>Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	46,12	141,48	0,33	Sus. + E3{1}	A06 N	41,41	141,48	0,29	SUS. + W1{1}

*Maximum hoop stress, allowable hoop stress, dan rasio hoop stress* hasil analisa pada bab 4.4.1 hingga bab 4.4.2 dapat dilihat pada Tabel 4.8 berikut.

Tabel 4.8 *Hoop Stress Blowdown Vent Pipe* pada Ketebalan Pipa Awal

<i>Hoop Stress (Hydrotest Condition)</i>									
Menggunakan <i>Expansion Joint</i>					Tanpa <i>Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A06 N	72,95	117,90	0,62	Max P{1}	A02 N	72,95	117,90	0,62	Max P{1}
<i>Hoop Stress (Operating Condition)</i>									
Menggunakan <i>Expansion Joint</i>					Tanpa <i>Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	17,02	117,90	0,14	Max P{1}	A02 N	17,02	117,90	0,14	Max P{1}

#### 4.5 Cek Rasio Tegangan dan *Deflection* Pipa

Dari hasil analisa *maximum stress* pada kondisi *hydrotest* dan *operating* sebelumnya, didapatkan rasio tegangan terbesar adalah 0,98 sehingga dapat disimpulkan bahwa pada ketebalan desain pipa yaitu 9,525 mm *blowdown tank vent* masih aman karena di bawah 1. Sedangkan untuk defleksi, menurut ASME B31.1 *allowable pipe deflection* adalah 5% dari *pipe inside diameter*.

Diketahui pipa memiliki diameter 650 mm dengan tebal 9,525 mm, maka *allowable pipe deflection* adalah 32,02 mm. Pada Tabel 4.9 dapat dilihat *maximum displacement* pada analisa pipa *blowdown tank vent*, dengan *displacement* terbesar 15,59 mm sehingga dapat disimpulkan pipa aman.

Tabel 4.9 *Maximum Displacement Blowdown Vent Pipe* pada Ketebalan Pipa Awal Dengan *Expansion Joint*

Keterangan	<i>Point</i>	<i>Maximum Displacement (mm)</i>			
		Dx	Dy	Dz	Total
<i>Hydrotest Condition</i>	A05	-2,77	-3,85	-4,73	6,7
<i>Operating Condition</i>	A05	-6,39	-9,02	-10,91	15,53

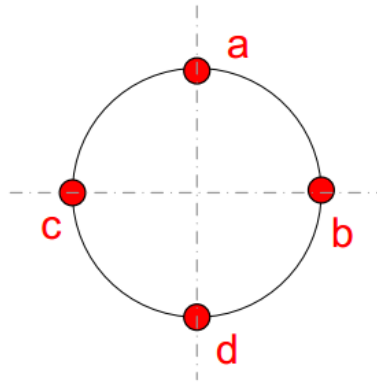
#### 4.6 Pemodelan di AutoPIPE dengan Variasi Ketebalan Pipa

Pada tahap ini, dilakukan model pipa yang telah dibuat divariasikan ketebalannya, Berikut adalah data uji *pipe thickness*, lokasi pengambilan uji *thickness* diprioritaskan dengan memperhatikan hal-hal berikut:

- a. Lokasi pipa dengan area terbuka, sehingga berisiko terjadi korosi akibat air hujan atau lainnya.

- b. Lokasi pipa dengan beban kritis seperti sambungan *elbow*, *tee*
- c. Lokasi pipa sebelum dan sesudah *valve*

Pada tiap lokasi uji, diambil empat titik *sample* seperti pada Gambar 4.12 berikut.



Gambar 4.12 Penampang Uji *Thickness* Pipa

Tabel 4.10 Hasil Uji *Thickness* (Selected)

Material A-106 Gr. B			
<i>Initial Thickness</i>	Titik Uji	Hasil Uji <i>Thickness</i> (mm)	Deviasi (%)
9,525	a	8,501	10,75
	b	7,989	16,13
	c	10,754	-12,9
	d	10,139	-6,45
9,525	a	10,242	-7,53
	b	8,808	7,53
	c	10,344	-8,6
	d	9,696	-1,8

Variasi ketebalan pipa akibat korosi dimodelkan dengan menganggap ketebalan pipa akibat korosi sama pada semua titik. Dari data pada Tabel 4.10 dapat dilihat jika deviasi pipa terbesar adalah 16,13%; 10,75%; dan 7,53%. Maka dibuatlah model *blowdown tank vent* dengan variasi ketebalan sebesar 7,989 mm; 8,501 mm; dan 8,808 mm. Namun perlu diingat bahwa apabila pemodelan dilakukan dengan menganggap penipisan pada pipa sama pada semua titik tentunya hasil pemodelan kurang mewakili kondisi *real* korosi yang terjadi pada pipa di lapangan, sehingga pemodelan yang lebih baik perlu memperhatikan beda ketebalan pipa pada berbagai titik (tidak dilakukan pada penelitian ini). Pada analisa tegangan dengan variasi ketebalan pipa akibat korosi ini, pemodelan dilakukan pada

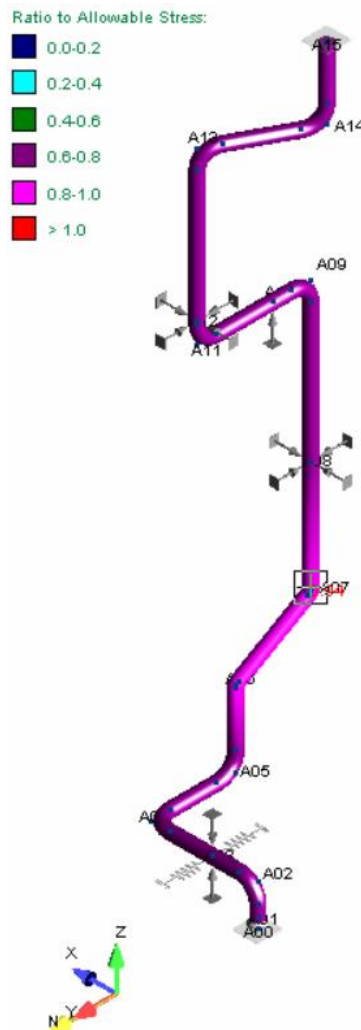
kondisi *hydrotest* dan *operating*, dengan menggunakan *expansion joint* dan tanpa menggunakan *expansion joint*.

#### 4.7 Analisa Tegangan Pipa dengan Ketebalan Variasi Ketebalan Pipa

Hasil analisa tegangan didapatkan dari *stress analysis* pada model di AutoPIPE, berikut adalah hasil tegangan maksimal di *blowdown tank line pipe* pada *operating and hydrotest condition* dengan ketebalan pipa yang telah divariasikan.

##### 4.7.1. Tegangan pada *Hydrotest Condition* (Dengan *Expansion Joint*, *Pipe Thickness 8,808 mm*)

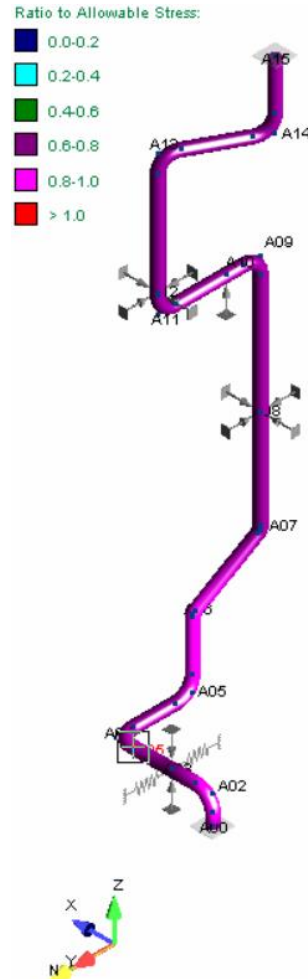
Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang menggunakan *expansion joint* pada *hydrotest condition*. Hasil analisa rasio tegangan dapat dilihat pada Gambar 4.13 berikut.



Gambar 4.13 Rasio Tegangan *Blowdown Tank Vent* pada *Hydrotest Condition* (Dengan *Expansion Joint*, *Pipe Thickness 8,808 mm*)

#### 4.7.2. Tegangan pada *Hydrotest Condition* (Tanpa *Expansion Joint*, *Pipe Thickness 8,808 mm*)

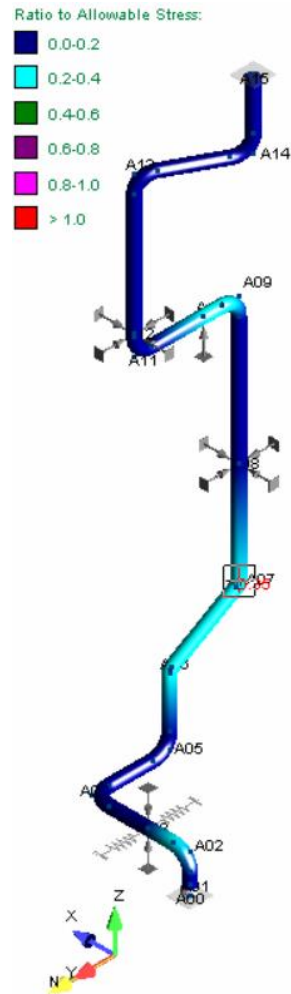
Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang tidak menggunakan *expansion joint* pada *hydrotest condition*. Hasil analisa tegangan dapat dilihat pada Gambar 4.14 berikut.



Gambar 4.14 Rasio Tegangan *Blowdown Tank Vent* pada *Hydrotest Condition* (Tanpa *Expansion Joint*, *Pipe Thickness 8,808 mm*)

#### 4.7.3. Tegangan pada *Operating Condition* (Dengan *Expansion Joint*, *Pipe Thickness 8,808 mm*)

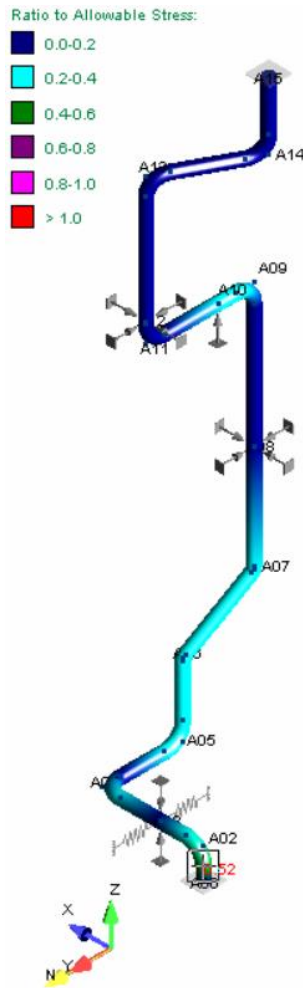
Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang menggunakan *expansion joint* pada *operating condition*. Hasil analisa tegangan dapat dilihat pada Gambar 4.15 berikut.



Gambar 4.15 Rasio Tegangan *Blowdown Tank Vent* pada *Operating Condition* (Dengan *Expansion Joint*, *Pipe Thickness* 8,808 mm)

#### 4.7.4. Tegangan Maksimal pada *Operating Condition* (Tanpa *Expansion Joint*, *Pipe Thickness* 8,808 mm)

Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang tidak menggunakan *expansion joint* pada *hydrotest condition*. Hasil analisa tegangan dapat dilihat pada Gambar 4.16 berikut.



Gambar 4.16 Tegangan *Blowdown Tank Vent* pada *Hydrotest Condition* (Tanpa *Expansion Joint*, *Pipe Thickness* 8,808 mm)

*Maximum sustained stress*, *allowable sustained stress*, dan rasio *sustained stress* hasil analisa pada bab 4.7.1 hingga bab 4.7.4 dapat dilihat pada Tabel 4.11 berikut.

Tabel 4.11 *Sustained Stress Blowdown Vent Pipe* pada *Ketebalan Pipa* 8,808 mm

<i>Sustained Stress (Hydrotest Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	111,31	117,90	0,94	GR + Max P{1}	A06 F	92,78	117,90	0,79	GR + Max P{1}
<i>Sustained Stress (Operating Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	41,00	117,90	0,35	GR + Max P{1}	A06 F	33,92	117,90	0,29	GR + Max P{1}

*Maximum displacement stress, allowable displacement stress, dan rasio displacement stress* hasil analisa pada bab 4.7.1 hingga bab 4.7.4 dapat dilihat pada Tabel 4.12 berikut.

Tabel 4.12 *Displacement Stress Blowdown Vent Pipe* pada Ketebalan Pipa 8,808 mm

<i>Displacement Stress (Hydrotest Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A06 N	124,98	176,85	0,71	Max Range	A04 N	168,88	176,85	0,95	Max Range
<i>Displacement Stress (Operating Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 N	5,59	176,85	0,03	Max Range	A02 N	92,20	176,85	0,52	Max Range

*Maximum occasional stress, allowable occasional stress, dan rasio occasional stress* hasil analisa bab 4.7.1 hingga bab 4.7.4 dapat dilihat pada Tabel 4.13 berikut.

Tabel 4.13 *Occasional Stress Blowdown Vent Pipe* pada Ketebalan Pipa 8,808 mm

<i>Occasional Stress (Hydrotest Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	129,04	141,48	0,91	Sus. + E3{1}	A06 F	114,33	141,48	0,81	Sus. + E1 {1}
<i>Occasional Stress (Operating Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	48,28	141,48	0,34	Sus. + E3{1}	A06 N	44,55	141,48	0,31	SUS. + W1 {1}

*Maximum hoop stress, allowable hoop stress, dan rasio hoop stress* hasil analisa pada bab 4.7.1 hingga bab 4.7.4 dapat dilihat pada Tabel 4.14 berikut.

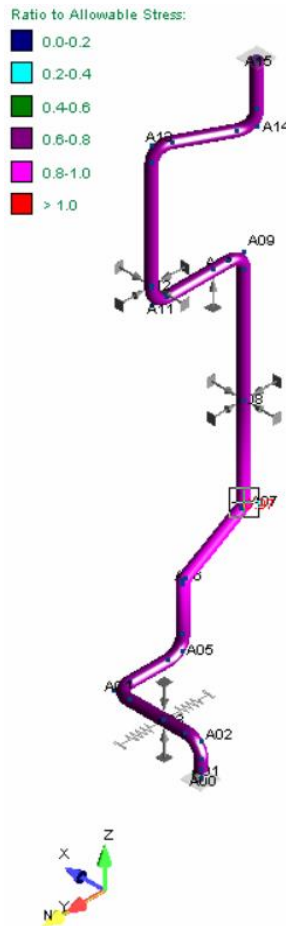


Tabel 4.14 *Hoop Stress Blowdown Vent Pipe* pada Ketebalan Pipa 8,808 mm

<i>Hoop Stress (Hydrotest Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	80,5	117,90	0,68	Max P{1}	A02 N	80,5	117,90	0,68	Max P{1}
<i>Hoop Stress (Operating Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	18,78	117,90	0,16	Max P{1}	A02 N	18,78	117,90	0,16	Max P{1}

**4.7.5. Tegangan pada *Hydrotest Condition* (Dengan *Expansion Joint*, *Pipe Thickness* 8,501 mm)**

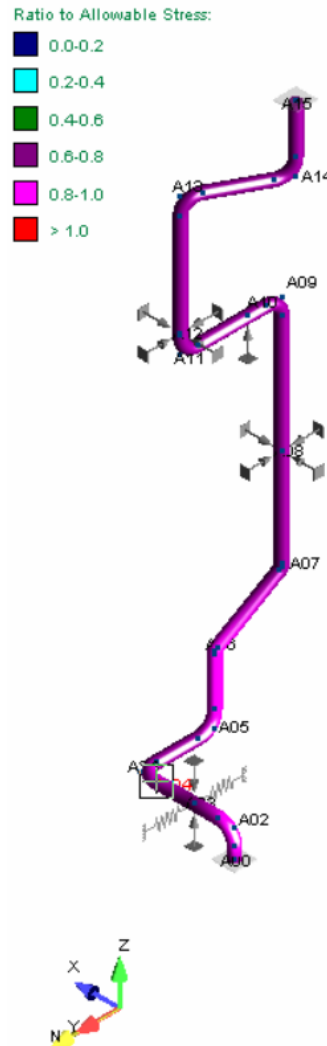
Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang menggunakan *expansion joint* pada *hydrotest condition*. Hasil analisa rasio tegangan dapat dilihat pada Gambar 4.17 berikut.



Gambar 4.17 Rasio Tegangan *Blowdown Tank Vent* pada *Hydrotest Condition* (Dengan *Expansion Joint*, *Pipe Thickness* 8,501 mm)

#### 4.7.6. Tegangan pada *Hydrotest Condition* (Tanpa *Expansion Joint*, *Pipe Thickness 8,501 mm*)

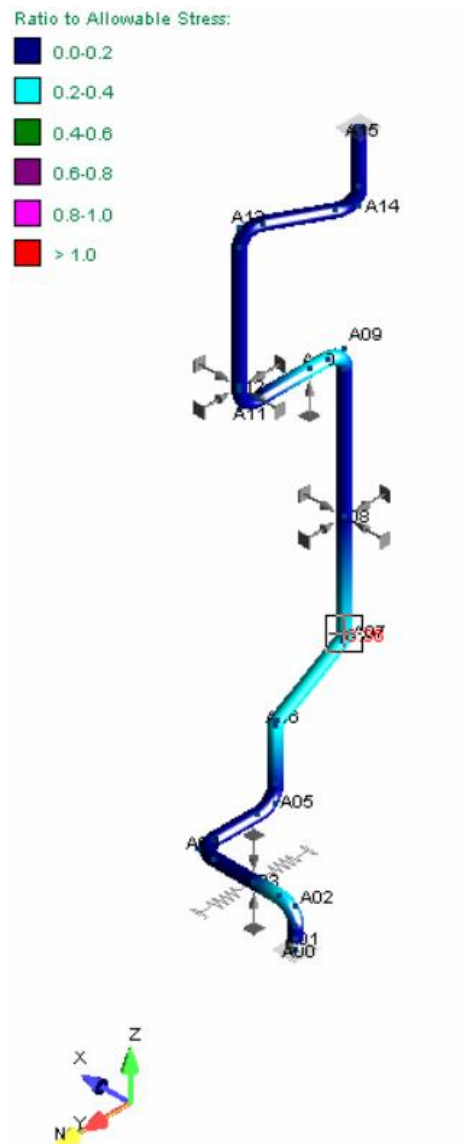
Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang tidak menggunakan *expansion joint* pada *hydrotest condition*. Hasil analisa tegangan dapat dilihat pada Gambar 4.18 berikut.



Gambar 4.18 Rasio Tegangan *Blowdown Tank Vent* pada *Hydrotest Condition* (Tanpa *Expansion Joint*, *Pipe Thickness 8,501 mm*)

#### 4.7.7. Tegangan pada *Operating Condition* (Dengan *Expansion Joint*, *Pipe Thickness 8,501 mm*)

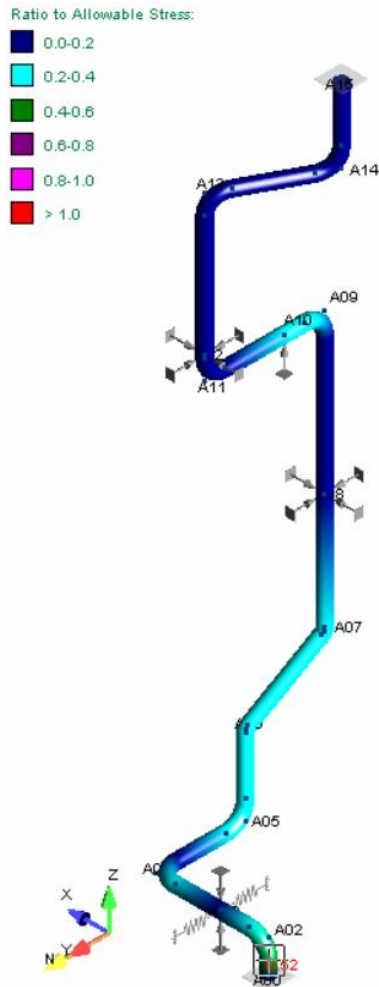
Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang menggunakan *expansion joint* pada *operating condition*. Hasil analisa tegangan dapat dilihat pada Gambar 4.19 berikut.



Gambar 4.19 Rasio Tegangan *Blowdown Tank Vent* pada *Operating Condition* (Dengan *Expansion Joint*, *Pipe Thickness* 8,501 mm)

#### 4.7.8. Tegangan Maksimal pada *Operating Condition* (Tanpa *Expansion Joint*, *Pipe Thickness* 8,501 mm)

Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang tidak menggunakan *expansion joint* pada *hydrotest condition*. Hasil analisa tegangan dapat dilihat pada Gambar 4.20 berikut.



Gambar 4.20 Tegangan *Blowdown Tank Vent* pada *Hydrotest Condition* (Tanpa *Expansion Joint*, *Pipe Thickness* 8,501 mm)

*Maximum sustained stress*, *allowable sustained stress*, dan rasio *sustained stress* hasil analisa pada bab 4.7.5 hingga bab 4.7.8 dapat dilihat pada Tabel 4.15 berikut.

Tabel 4.15 *Sustained Stress Blowdown Vent Pipe* pada *Ketebalan Pipa* 8,501 mm

<i>Sustained Stress (Hydrotest Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	114,57	117,90	0,97	GR + Max P{1}	A06 F	95,79	117,90	0,81	GR + Max P{1}
<i>Sustained Stress (Operating Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	41,88	117,90	0,36	GR + Max P{1}	106 F	34,81	117,90	0,30	GR + Max P{1}

*Maximum displacement stress, allowable displacement stress, dan rasio displacement stress* hasil analisa pada bab 4.7.5 hingga bab 4.7.8 dapat dilihat pada Tabel 4.16 berikut.

Tabel 4.16 *Displacement Stress Blowdown Vent Pipe* pada Ketebalan Pipa 8,501 mm

<i>Displacement Stress (Hydrotest Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A06 N	124,37	176,85	0,70	Max Range	A04 N	166,44	176,85	0,94	Max Range
<i>Displacement Stress (Operating Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 N	5,84	176,85	0,03	Max Range	A02 N	91,16	176,85	0,52	Max Range

*Maximum occasional stress, allowable occasional stress, dan rasio occasional stress* hasil analisa pada bab 4.7.5 hingga bab 4.7.8 dapat dilihat pada Tabel 4.17 berikut.

Tabel 4.17 *Occasional Stress Blowdown Vent Pipe* pada Ketebalan Pipa 8,501 mm

<i>Occasional Stress (Hydrotest Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	132,73	141,48	0,94	Sus. + E3{1}	A06 F	118,01	141,48	0,83	Sus. + E1{1}
<i>Occasional Stress (Operating Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	49,27	141,48	0,35	Sus. + E3{1}	A06 N	46,04	141,48	0,33	SUS. + W1{1}

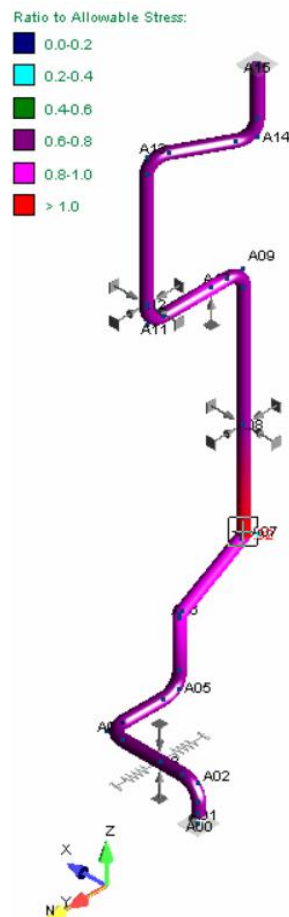
*Maximum hoop stress, allowable hoop stress, dan rasio hoop stress* hasil analisa bab 4.7.1 hingga bab 4.7.4 dapat dilihat pada Tabel 4.18 berikut.

Tabel 4.18 Occasional Stress Blowdown Vent Pipe pada Ketebalan Pipa 8,501 mm

Hoop Stress (Hydrotest Condition)									
Menggunakan Expansion Joint					Tanpa Expansion Joint				
Point	Stress (N/mm <sup>2</sup> )	Allowable (N/mm <sup>2</sup> )	Ratio	Loads	Point	Stress (N/mm <sup>2</sup> )	Allowable (N/mm <sup>2</sup> )	Ratio	Loads
A07 F	84,24	117,90	0,71	Max P{1}	A02 N	84,24	117,90	0,71	Max P{1}
Hoop Stress (Operating Condition)									
Menggunakan Expansion Joint					Tanpa Expansion Joint				
Point	Stress (N/mm <sup>2</sup> )	Allowable (N/mm <sup>2</sup> )	Ratio	Loads	Point	Stress (N/mm <sup>2</sup> )	Allowable (N/mm <sup>2</sup> )	Ratio	Loads
A07 F	19,66	117,90	0,17	Max P{1}	A02 N	19,66	117,90	0,17	Max P{1}

#### 4.7.9. Tegangan pada Hydrotest Condition (Dengan Expansion Joint, Pipe Thickness 7,989 mm)

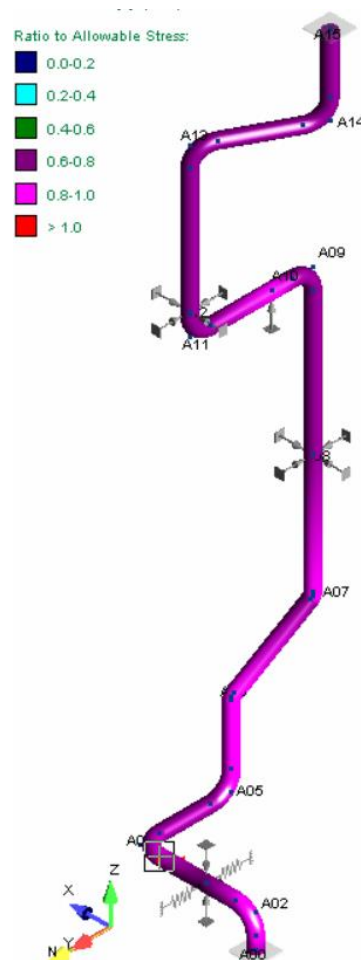
Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang menggunakan *expansion joint* pada *hydrotest condition*. Hasil analisa rasio tegangan dapat dilihat pada Gambar 4.21 berikut.



Gambar 4.21 Rasio Tegangan Blowdown Tank Vent pada Hydrotest Condition (Dengan Expansion Joint, Pipe Thickness 7,989 mm)

#### 4.7.10. Tegangan pada *Hydrotest Condition* (Tanpa *Expansion Joint*, *Pipe Thickness 7,989 mm*)

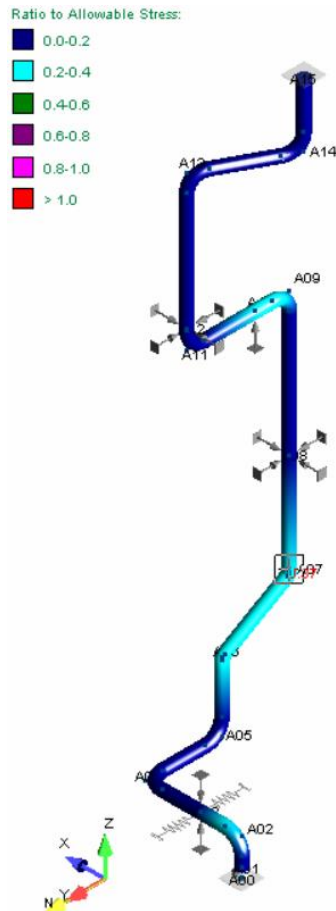
Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang tidak menggunakan *expansion joint* pada *hydrotest condition*. Hasil analisa tegangan dapat dilihat pada Gambar 4.22 berikut.



Gambar 4.22 Rasio Tegangan *Blowdown Tank Vent* pada *Hydrotest Condition* (Tanpa *Expansion Joint*, *Pipe Thickness 7,989 mm*)

#### 4.7.11. Tegangan pada *Operating Condition* (Dengan *Expansion Joint*, *Pipe Thickness 7,989 mm*)

Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang menggunakan *expansion joint* pada *operating condition*. Hasil analisa tegangan dapat dilihat pada Gambar 4.23 berikut.

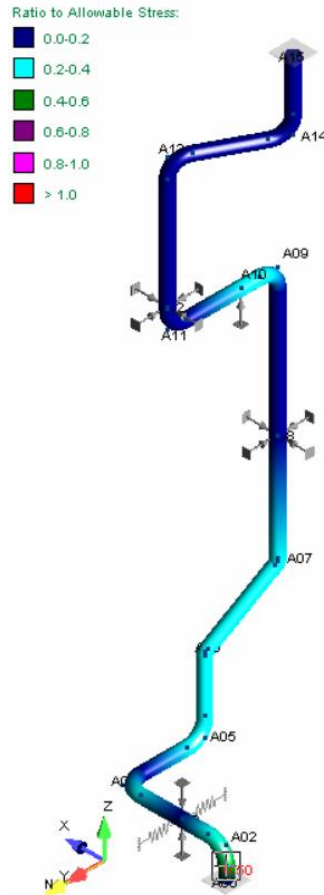


Gambar 4.23 Rasio Tegangan *Blowdown Tank Vent* pada *Operating Condition* (Dengan *Expansion Joint*, *Pipe Thickness 7,989 mm*)

#### 4.7.12. Tegangan Maksimal pada *Operating Condition* (Tanpa *Expansion Joint*, *Pipe Thickness 7,989 mm*)

Berikut adalah tegangan maksimal hasil dari analisa tegangan *blowdown tank vent* yang tidak menggunakan *expansion joint* pada *hydrotest condition*. Hasil analisa tegangan dapat dilihat pada Gambar 4.24 berikut.





Gambar 4.24 Tegangan *Blowdown Tank Vent* pada *Hydrotest Condition* (Tanpa *Expansion Joint*, *Pipe Thickness* 7,989 mm)

*Maximum sustained stress*, *allowable sustained stress*, dan rasio *sustained stress* hasil analisa pada bab 4.7.9 hingga bab 4.7.12 dapat dilihat pada Tabel 4.19 berikut.

Tabel 4.19 *Sustained Stress Blowdown Vent Pipe* pada Ketebalan Pipa 7,989 mm

<i>Sustained Stress (Hydrotest Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	120,28	117,90	1,02	GR + Max P{1}	A06 F	101,1	117,90	0,86	GR + Max P{1}
<i>Sustained Stress (Operating Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	43,45	117,90	0,37	GR + Max P{1}	A06 F	36,42	117,90	0,31	GR + Max P{1}

*Maximum displacement stress, allowable displacement stress, dan rasio displacement stress* hasil analisa pada bab 4.7.9 hingga bab 4.7.12 dapat dilihat pada Tabel 4.16 berikut.

Tabel 4.20 *Displacement Stress Blowdown Vent Pipe* pada Ketebalan Pipa 7,989 mm

<i>Displacement Stress (Hydrotest Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A06 N	123,19	176,85	0,70	Max Range	A04 N	161,82	176,85	0,92	Max Range
<i>Displacement Stress (Operating Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 N	6,28	176,85	0,04	Max Range	A02 N	89,28	176,85	0,50	Max Range

*Maximum occasional stress, allowable occasional stress, dan rasio occasional stress* hasil analisa pada bab 4.7.9 hingga bab 4.7.12 dapat dilihat pada Tabel 4.21 berikut.

Tabel 021 *Occasional Stress Blowdown Vent Pipe* pada Ketebalan Pipa 7,989 mm

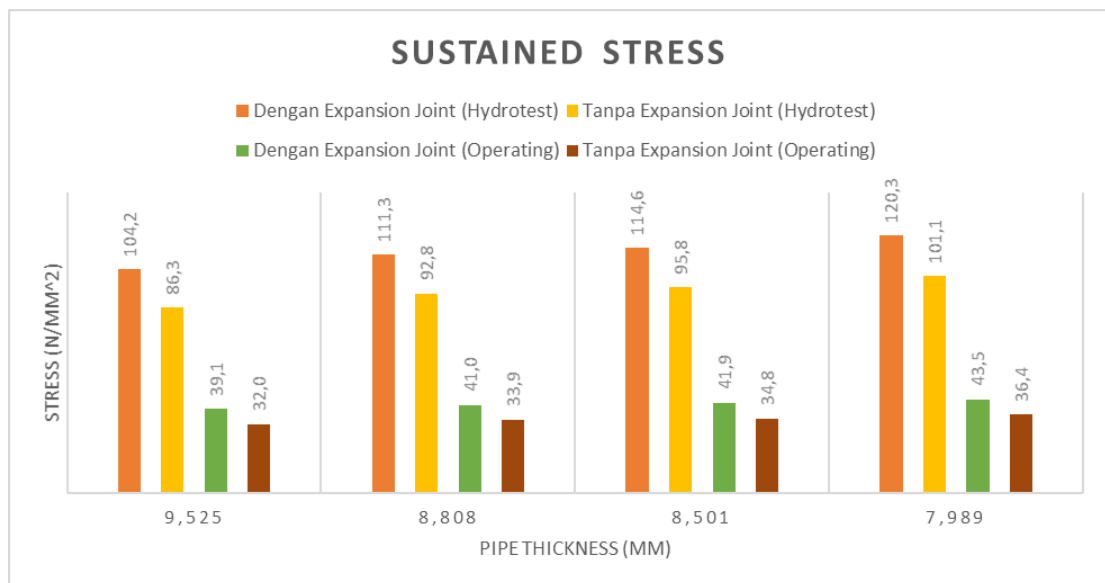
<i>Occasional Stress (Hydrotest Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	139,16	141,48	0,98	Sus. + E3{1}	A06 F	124,48	141,48	0,88	Sus. + E1{1}
<i>Occasional Stress (Operating Condition)</i>									
<i>Menggunakan Expansion Joint</i>					<i>Tanpa Expansion Joint</i>				
<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>	<i>Point</i>	<i>Stress (N/mm<sup>2</sup>)</i>	<i>Allowable (N/mm<sup>2</sup>)</i>	<i>Ratio</i>	<i>Loads</i>
A07 F	51,44	141,48	0,36	Sus. + E3{1}	A06 N	48,77	141,48	0,34	SUS. + W1{1}

*Maximum hoop stress, allowable hoop stress, dan rasio hoop stress* hasil analisa 4.7.9 hingga bab 4.7.12 dapat dilihat pada Tabel 4.22 berikut.

Tabel 4.22 Occasional Stress Blowdown Vent Pipe pada Ketebalan Pipa 7,989 mm

Hoop Stress (Hydrotest Condition)									
Menggunakan Expansion Joint					Tanpa Expansion Joint				
Point	Stress (N/mm <sup>2</sup> )	Allowable (N/mm <sup>2</sup> )	Ratio	Loads	Point	Stress (N/mm <sup>2</sup> )	Allowable (N/mm <sup>2</sup> )	Ratio	Loads
A07 F	91,29	117,90	0,77	Max P{1}	A02 N	91,29	117,90	0,77	Max P{1}
Hoop Stress (Operating Condition)									
Menggunakan Expansion Joint					Tanpa Expansion Joint				
Point	Stress (N/mm <sup>2</sup> )	Allowable (N/mm <sup>2</sup> )	Ratio	Loads	Point	Stress (N/mm <sup>2</sup> )	Allowable (N/mm <sup>2</sup> )	Ratio	Loads
A07 F	21,3	117,90	0,18	Max P{1}	A02 N	21,3	117,90	0,18	Max P{1}

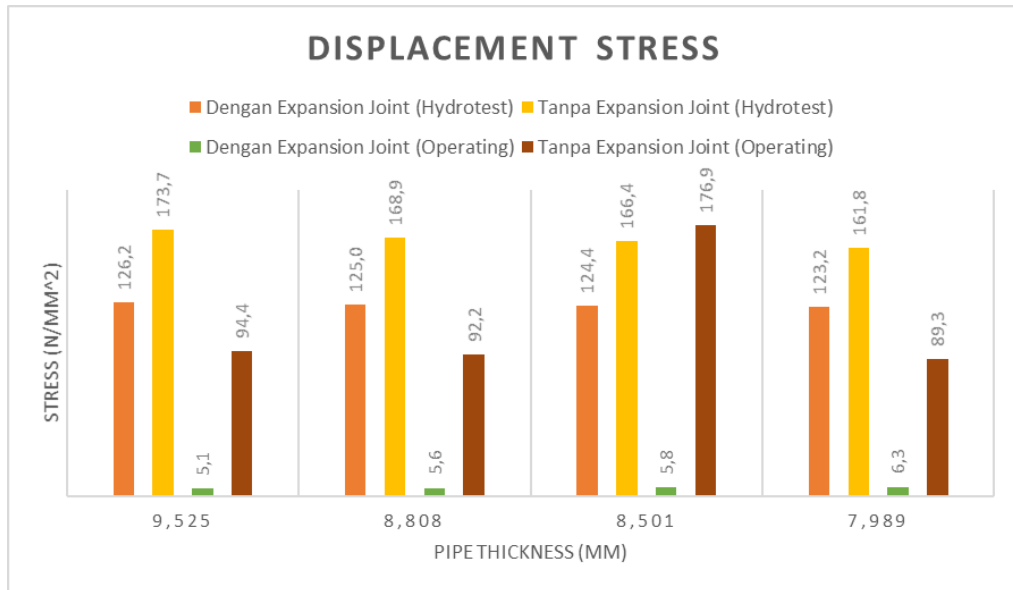
Grafik yang terjadi pada *blowdown tank vent* hasil analisa di *software* AutoPIPE untuk semua variasi dapat dilihat pada Gambar 4.25 berikut.



Gambar 4.25 Sustained Stress Hasil Analisa Semua Variasi

Dari Gambar 4.25 di atas dapat dilihat jika *sustained stress* mengalami kenaikan seiring menipisnya ketebalan pipa, penggunaan *expansion joint* pada pipa menyebabkan *sustained stress* naik, dan *sustained stress* yang terjadi pada pipa lebih besar saat *hydrotest condition* daripada saat *operating condition*.

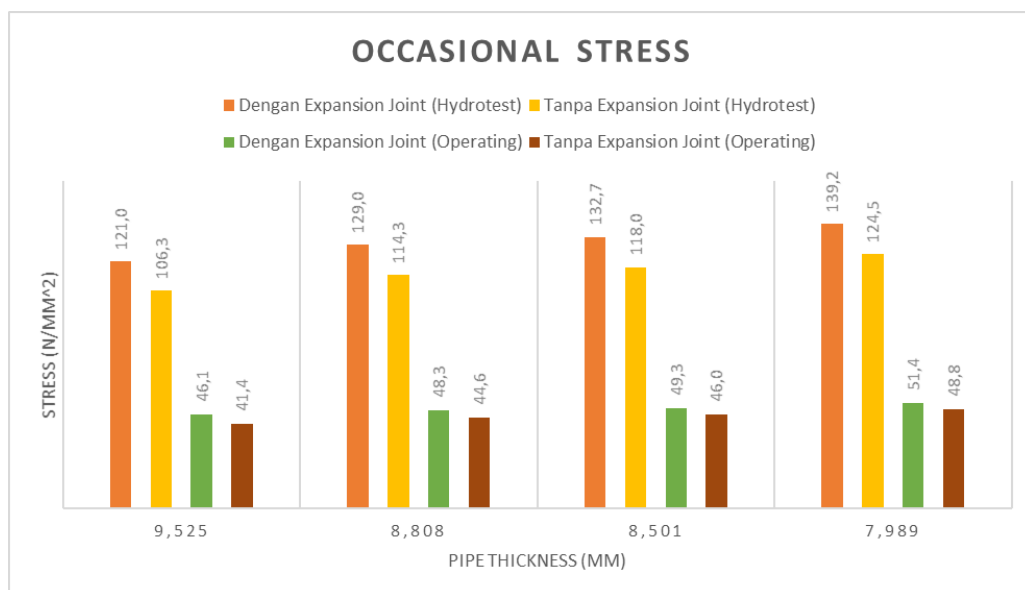
Grafik *displacement stress* yang terjadi pada *blowdown tank vent* hasil analisa di *software* AutoPIPE untuk semua variasi dapat dilihat pada Gambar 4.26 berikut.



Gambar 4.26 *Displacement Stress* Hasil Analisa Semua Variasi

Dari Gambar 4.26 di atas dapat dilihat jika *displacement stress* mengalami penurunan seiring menipisnya ketebalan pipa, penggunaan *expansion joint* pada pipa menyebabkan *displacement stress* turun, dan *displacement stress* yang terjadi pada pipa lebih besar saat *hydrotest condition* daripada saat *operating condition*.

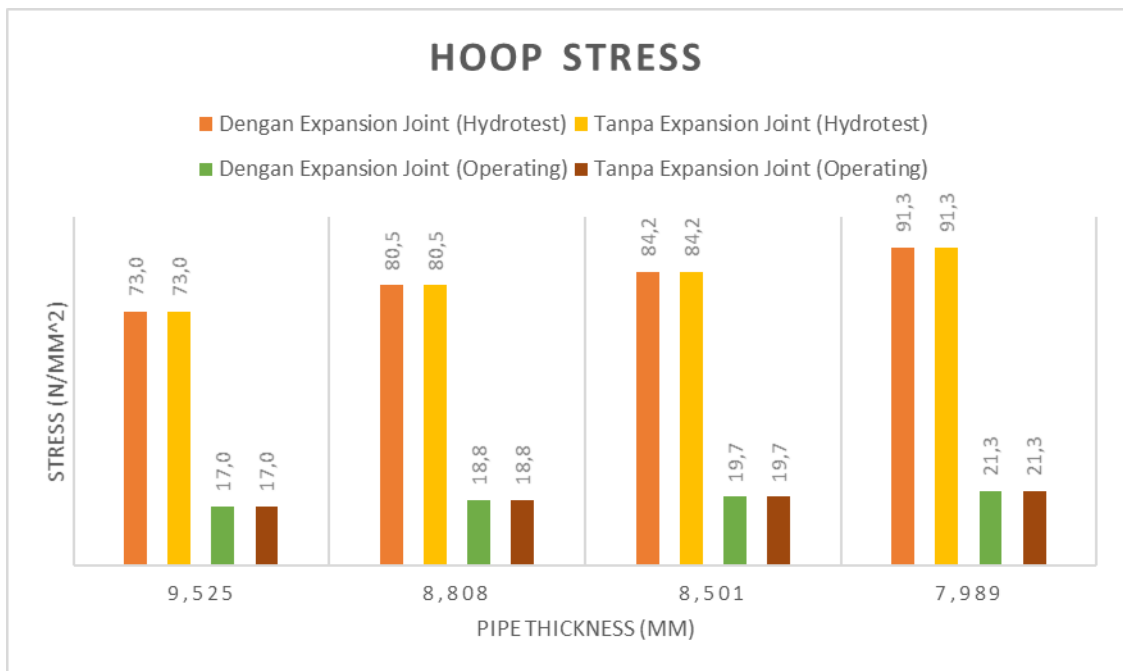
Grafik *occasional stress* yang terjadi pada *blowdown tank vent* hasil analisa di *software* AutoPIPE untuk semua variasi dapat dilihat pada Gambar 4.27 berikut.



Gambar 4.27 *Occasional Stress* Hasil Analisa Semua Variasi

Dari Gambar 4.27 di atas dapat dilihat jika *occasional stress* mengalami kenaikan seiring menipisnya ketebalan pipa, penggunaan *expansion joint* pada pipa menyebabkan *occasional stress* naik, dan *occasional stress* yang terjadi pada pipa lebih besar saat *hydrotest condition* daripada saat *operating condition*.

Grafik *hoop stress* yang terjadi pada *blowdown tank vent* hasil analisa di *software* AutoPIPE untuk semua variasi dapat dilihat pada Gambar 4.28 berikut.



Gambar 4.28 *Hoop Stress* Hasil Analisa Semua Variasi

Dari Gambar 4.28 di atas dapat dilihat jika *hoop stress* mengalami kenaikan seiring menipisnya ketebalan pipa, penggunaan *expansion joint* tidak berpengaruh pada *hoop stress* yang terjadi pada pipa, dan *hoop stress* yang terjadi pada pipa lebih besar saat *hydrotest condition* daripada saat *operating condition*.

## BAB V

### PENUTUP

#### 5.1 Kesimpulan

Dari analisa dan pembahasan pada Bab IV yang dilakukan dalam Tugas Akhir ini, didapatkan beberapa kesimpulan sebagai berikut:

1. Penggunaan *expansion joint* menyebabkan turunnya *displacement stress*.
2. Menipisnya ketebalan pipa menyebabkan naiknya *sustained, occasional*, dan *hoop stress*, namun *displacement stress* justru mengalami penurunan.
3. Tegangan pipa pada *hydrotest condition* lebih besar daripada tegangan pipa saat *operating condition*.

#### 5.2 Saran

Berikut ini adalah beberapa hal yang dapat dijadikan saran untuk penelitian selanjutnya yang berhubungan dengan Tugas Akhir ini:

1. Pada penelitian selanjutnya perlu dianalisa *local stress* yang terjadi pada pipa, khususnya setelah pipa mengalami korosi.
2. Pada penelitian selanjutnya dapat dilakukan analisa dengan variasi penggunaan *pipe support* yang tentunya sangat berpengaruh pada tegangan yang terjadi pada pipa.
3. Pada penelitian selanjutnya data korosi dan *as build drawing* dapat dilakukan dengan melakukan pengukuran langsung dari lapangan jika memang memungkinkan.
4. Pada penelitian selanjutnya dapat dilakukan analisa dengan pemodelan ketebalan pipa yang berbeda pada tiap titiknya, sehingga dapat mewakili kondisi *real* pipa di lapangan.

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## **LAMPIRAN-LAMPIRAN**

## **LAMPIRAN A**

*GENERAL PIPE STRESS REPORT (HYDROTEST CONDITION WITH  
EXPANSION JOINT, PIPE THICKNESS = 9,525 mm)*

Hydrotest Condition with Expansion  
 01/08/2018 BLOWDOWN TANK VENT STRESS ANALYSIS  
 04:39 AM  
 RESULT PAGE 91

BENTLEY  
 AutoPIPE Standard 10.01.00.08

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A06 N+	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	37514			6.70	(15) SUST	86.38	117.90
	TR:Amb to T1{1}			58790	6.70	(17) DISP	126.16	176.85
	Amb to T1{1}			58790	6.70	(17) DISP	126.16	176.85
	Sus. + E1{1}	37514	14988		6.70	(16) OCC	110.50	141.48
	Sus. + E2{1}	37514	14988		6.70	(16) OCC	110.50	141.48
	Sus. + E3{1}	37514	11594		6.70	(16) OCC	105.04	141.48
	Sus. + E4{1}	37514	11594		6.70	(16) OCC	105.04	141.48
	Sus. + W1{1}	37514	4320		6.70	(16) OCC	93.33	141.48
	Sus. + W2{1}	37514	4320		6.70	(16) OCC	93.33	141.48
	Sus. + W3{1}	37514	3326		6.70	(16) OCC	91.73	141.48
	Sus. + W4{1}	37514	3326		6.70	(16) OCC	91.73	141.48
A07 F-	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	48583			6.70	(15) SUST	104.19	117.90
	TR:Amb to T1{1}			17233	6.70	(17) DISP	36.98	176.85
	Amb to T1{1}			17233	6.70	(17) DISP	36.98	176.85
	Sus. + E1{1}	48583	4339		6.70	(16) OCC	111.18	141.48
	Sus. + E2{1}	48583	4339		6.70	(16) OCC	111.18	141.48
	Sus. + E3{1}	48583	10426		6.70	(16) OCC	120.97	141.48
	Sus. + E4{1}	48583	10426		6.70	(16) OCC	120.97	141.48
	Sus. + W1{1}	48583	2310		6.70	(16) OCC	107.91	141.48
	Sus. + W2{1}	48583	2310		6.70	(16) OCC	107.91	141.48
	Sus. + W3{1}	48583	2594		6.70	(16) OCC	108.37	141.48
	Sus. + W4{1}	48583	2594		6.70	(16) OCC	108.37	141.48
A06 F-	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	37683			6.70	(15) SUST	86.65	117.90
	TR:Amb to T1{1}			55702	6.70	(17) DISP	119.54	176.85
	Amb to T1{1}			55702	6.70	(17) DISP	119.54	176.85
	Sus. + E1{1}	37683	14606		6.70	(16) OCC	110.16	141.48
	Sus. + E2{1}	37683	14606		6.70	(16) OCC	110.16	141.48
	Sus. + E3{1}	37683	11815		6.70	(16) OCC	105.67	141.48
	Sus. + E4{1}	37683	11815		6.70	(16) OCC	105.67	141.48
	Sus. + W1{1}	37683	4165		6.70	(16) OCC	93.35	141.48
	Sus. + W2{1}	37683	4165		6.70	(16) OCC	93.35	141.48
	Sus. + W3{1}	37683	3405		6.70	(16) OCC	92.13	141.48
	Sus. + W4{1}	37683	3405		6.70	(16) OCC	92.13	141.48

Hydrotest Condition with Expansion  
 01/08/2018 BLOWDOWN TANK VENT STRESS ANALYSIS  
 04:39 AM  
 RESULT PAGE 92

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A05 N+	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	22612			3.27	(15) SUST	43.75	117.90
	TR:Amb to T1{1}			113643	3.27	(17) DISP	118.93	176.85
	Amb to T1{1}			113643	3.27	(17) DISP	118.93	176.85
	Sus. + E1{1}	22612	14573		3.27	(16) OCC	55.19	141.48
	Sus. + E2{1}	22612	14573		3.27	(16) OCC	55.19	141.48
	Sus. + E3{1}	22612	9621		3.27	(16) OCC	51.30	141.48
	Sus. + E4{1}	22612	9621		3.27	(16) OCC	51.30	141.48
	Sus. + W1{1}	22612	3725		3.27	(16) OCC	46.67	141.48
	Sus. + W2{1}	22612	3725		3.27	(16) OCC	46.67	141.48
	Sus. + W3{1}	22612	2419		3.27	(16) OCC	45.65	141.48
	Sus. + W4{1}	22612	2419		3.27	(16) OCC	45.65	141.48
A07 N+	Max P{1}					( 3) HOOP	72.95	117.90

GR + Max P{1}	46593		6.70	(15)	SUST	100.99	117.90
TR:Amb to T1{1}			14003	6.70	(17)	DISP	30.05 176.85
Amb to T1{1}			14003	6.70	(17)	DISP	30.05 176.85
Sus. + E1{1}	46593	5307	6.70	(16)	OCC	109.53	141.48
Sus. + E2{1}	46593	5307	6.70	(16)	OCC	109.53	141.48
Sus. + E3{1}	46593	10836	6.70	(16)	OCC	118.43	141.48
Sus. + E4{1}	46593	10836	6.70	(16)	OCC	118.43	141.48
Sus. + W1{1}	46593	1634	6.70	(16)	OCC	103.62	141.48
Sus. + W2{1}	46593	1634	6.70	(16)	OCC	103.62	141.48
Sus. + W3{1}	46593	2767	6.70	(16)	OCC	105.44	141.48
Sus. + W4{1}	46593	2767	6.70	(16)	OCC	105.44	141.48
A05 F- Max P{1}							
GR + Max P{1}	22131		3.27	(15)	SUST	43.37	117.90
TR:Amb to T1{1}			108971	3.27	(17)	DISP	114.04 176.85
Amb to T1{1}			108971	3.27	(17)	DISP	114.04 176.85
Sus. + E1{1}	22131	17950	3.27	(16)	OCC	57.46	141.48
Sus. + E2{1}	22131	17950	3.27	(16)	OCC	57.46	141.48
Sus. + E3{1}	22131	7978	3.27	(16)	OCC	49.63	141.48
Sus. + E4{1}	22131	7978	3.27	(16)	OCC	49.63	141.48
Sus. + W1{1}	22131	4966	3.27	(16)	OCC	47.27	141.48
Sus. + W2{1}	22131	4966	3.27	(16)	OCC	47.27	141.48
Sus. + W3{1}	22131	1628	3.27	(16)	OCC	44.65	141.48
Sus. + W4{1}	22131	1628	3.27	(16)	OCC	44.65	141.48
A04 F- Max P{1}							
GR + Max P{1}	20744		3.27	(15)	SUST	42.28	117.90
TR:Amb to T1{1}			93017	3.27	(17)	DISP	97.34 176.85
Amb to T1{1}			93017	3.27	(17)	DISP	97.34 176.85
Sus. + E1{1}	20744	11953	3.27	(16)	OCC	51.66	141.48
Sus. + E2{1}	20744	11953	3.27	(16)	OCC	51.66	141.48
Sus. + E3{1}	20744	12179	3.27	(16)	OCC	51.84	141.48
Sus. + E4{1}	20744	12179	3.27	(16)	OCC	51.84	141.48
Sus. + W1{1}	20744	3099	3.27	(16)	OCC	44.71	141.48
Sus. + W2{1}	20744	3099	3.27	(16)	OCC	44.71	141.48
Sus. + W3{1}	20744	2870	3.27	(16)	OCC	44.53	141.48
Sus. + W4{1}	20744	2870	3.27	(16)	OCC	44.53	141.48

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ASME B31.1 (2014) CODE COMPLIANCE										
Point name	Load combination	Moments in N.m			Stress in N/mm2			Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F					
A09 F- Max P{1}										
GR + Max P{1}		68723			3.27	(15)	SUST	79.94	117.90	
TR:Amb to T1{1}				89206	3.27	(17)	DISP	93.35	176.85	
Amb to T1{1}				89206	3.27	(17)	DISP	93.35	176.85	
Sus. + E1{1}		68723	4896		3.27	(16)	OCC	83.78	141.48	
Sus. + E2{1}		68723	4896		3.27	(16)	OCC	83.78	141.48	
Sus. + E3{1}		68723	6289		3.27	(16)	OCC	84.87	141.48	
Sus. + E4{1}		68723	6289		3.27	(16)	OCC	84.87	141.48	
Sus. + W1{1}		68723	1976		3.27	(16)	OCC	81.49	141.48	
Sus. + W2{1}		68723	1976		3.27	(16)	OCC	81.49	141.48	
Sus. + W3{1}		68723	1430		3.27	(16)	OCC	81.06	141.48	
Sus. + W4{1}		68723	1430		3.27	(16)	OCC	81.06	141.48	
A09 N+ Max P{1}										
GR + Max P{1}		38364			3.27	(15)	SUST	56.11	117.90	
TR:Amb to T1{1}				86243	3.27	(17)	DISP	90.25	176.85	
Amb to T1{1}				86243	3.27	(17)	DISP	90.25	176.85	
Sus. + E1{1}		38364	6341		3.27	(16)	OCC	61.09	141.48	
Sus. + E2{1}		38364	6341		3.27	(16)	OCC	61.09	141.48	
Sus. + E3{1}		38364	7225		3.27	(16)	OCC	61.78	141.48	
Sus. + E4{1}		38364	7225		3.27	(16)	OCC	61.78	141.48	
Sus. + W1{1}		38364	1623		3.27	(16)	OCC	57.39	141.48	
Sus. + W2{1}		38364	1623		3.27	(16)	OCC	57.39	141.48	
Sus. + W3{1}		38364	1823		3.27	(16)	OCC	57.54	141.48	
Sus. + W4{1}		38364	1823		3.27	(16)	OCC	57.54	141.48	
A10 + Max P{1}										
GR + Max P{1}		185982			1.00	(15)	SUST	85.53	117.90	
TR:Amb to T1{1}				61989	1.00	(17)	DISP	19.84	176.85	
Amb to T1{1}				61989	1.00	(17)	DISP	19.84	176.85	
Sus. + E1{1}		185982	5736		1.00	(16)	OCC	87.37	141.48	

	Sus. + E2{1}	185982	5736		1.00	(16)	OCC	87.37	141.48
	Sus. + E3{1}	185982	4741		1.00	(16)	OCC	87.05	141.48
	Sus. + E4{1}	185982	4741		1.00	(16)	OCC	87.05	141.48
	Sus. + W1{1}	185982	1762		1.00	(16)	OCC	86.09	141.48
	Sus. + W2{1}	185982	1762		1.00	(16)	OCC	86.09	141.48
	Sus. + W3{1}	185982	1137		1.00	(16)	OCC	85.89	141.48
	Sus. + W4{1}	185982	1137		1.00	(16)	OCC	85.89	141.48
A10	- Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	185982			1.00	(15)	SUST	85.53	117.90
	TR:Amb to T1{1}			61989	1.00	(17)	DISP	19.84	176.85
	Amb to T1{1}			61989	1.00	(17)	DISP	19.84	176.85
	Sus. + E1{1}	185982	5736		1.00	(16)	OCC	87.37	141.48
	Sus. + E2{1}	185982	5736		1.00	(16)	OCC	87.37	141.48
	Sus. + E3{1}	185982	4741		1.00	(16)	OCC	87.05	141.48
	Sus. + E4{1}	185982	4741		1.00	(16)	OCC	87.05	141.48
	Sus. + W1{1}	185982	1762		1.00	(16)	OCC	86.09	141.48
	Sus. + W2{1}	185982	1762		1.00	(16)	OCC	86.09	141.48
	Sus. + W3{1}	185982	1137		1.00	(16)	OCC	85.89	141.48
	Sus. + W4{1}	185982	1137		1.00	(16)	OCC	85.89	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type		
A13 N+	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	9606			3.27	(15) SUST	33.54	117.90
	TR:Amb to T1{1}			72380	3.27	(17) DISP	75.75	176.85
	Amb to T1{1}			72380	3.27	(17) DISP	75.75	176.85
	Sus. + E1{1}	9606	10950		3.27	(16) OCC	42.13	141.48
	Sus. + E2{1}	9606	10950		3.27	(16) OCC	42.13	141.48
	Sus. + E3{1}	9606	5253		3.27	(16) OCC	37.66	141.48
	Sus. + E4{1}	9606	5253		3.27	(16) OCC	37.66	141.48
	Sus. + W1{1}	9606	6590		3.27	(16) OCC	38.71	141.48
	Sus. + W2{1}	9606	6590		3.27	(16) OCC	38.71	141.48
	Sus. + W3{1}	9606	2622		3.27	(16) OCC	35.60	141.48
	Sus. + W4{1}	9606	2622		3.27	(16) OCC	35.60	141.48
A02 N+	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	15442			3.27	(15) SUST	38.12	117.90
	TR:Amb to T1{1}			71307	3.27	(17) DISP	74.62	176.85
	Amb to T1{1}			71307	3.27	(17) DISP	74.62	176.85
	Sus. + E1{1}	15442	13293		3.27	(16) OCC	48.55	141.48
	Sus. + E2{1}	15442	13293		3.27	(16) OCC	48.55	141.48
	Sus. + E3{1}	15442	11153		3.27	(16) OCC	46.87	141.48
	Sus. + E4{1}	15442	11153		3.27	(16) OCC	46.87	141.48
	Sus. + W1{1}	15442	3040		3.27	(16) OCC	40.51	141.48
	Sus. + W2{1}	15442	3040		3.27	(16) OCC	40.51	141.48
	Sus. + W3{1}	15442	2296		3.27	(16) OCC	39.92	141.48
	Sus. + W4{1}	15442	2296		3.27	(16) OCC	39.92	141.48
A15	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	9550			1.00	(15) SUST	29.06	117.90
	TR:Amb to T1{1}			27907	1.00	(17) DISP	8.93	176.85
	Amb to T1{1}			27907	1.00	(17) DISP	8.93	176.85
	Sus. + E1{1}	9550	33012		1.00	(16) OCC	39.62	141.48
	Sus. + E2{1}	9550	33012		1.00	(16) OCC	39.62	141.48
	Sus. + E3{1}	9550	34182		1.00	(16) OCC	40.00	141.48
	Sus. + E4{1}	9550	34182		1.00	(16) OCC	40.00	141.48
	Sus. + W1{1}	9550	18702		1.00	(16) OCC	35.04	141.48
	Sus. + W2{1}	9550	18702		1.00	(16) OCC	35.04	141.48
	Sus. + W3{1}	9550	14926		1.00	(16) OCC	33.83	141.48
	Sus. + W4{1}	9550	14926		1.00	(16) OCC	33.83	141.48
A14 F+	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	15514			1.00	(15) SUST	30.97	117.90
	TR:Amb to T1{1}			45857	1.00	(17) DISP	14.68	176.85
	Amb to T1{1}			45857	1.00	(17) DISP	14.68	176.85
	Sus. + E1{1}	15514	16985		1.00	(16) OCC	36.40	141.48
	Sus. + E2{1}	15514	16985		1.00	(16) OCC	36.40	141.48
	Sus. + E3{1}	15514	8054		1.00	(16) OCC	33.54	141.48
	Sus. + E4{1}	15514	8054		1.00	(16) OCC	33.54	141.48
	Sus. + W1{1}	15514	8115		1.00	(16) OCC	33.56	141.48

Sus. + W2{1}	15514	8115	1.00	(16)	OCC	33.56	141.48
Sus. + W3{1}	15514	3835	1.00	(16)	OCC	32.19	141.48
Sus. + W4{1}	15514	3835	1.00	(16)	OCC	32.19	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Moments in N.m )		(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type		
A14 F-	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	15514			3.27	(15)	SUST	38.18	117.90
	TR:Amb to T1{1}			45857	3.27	(17)	DISP	47.99	176.85
	Amb to T1{1}			45857	3.27	(17)	DISP	47.99	176.85
	Sus. + E1{1}	15514	16985		3.27	(16)	OCC	51.51	141.48
	Sus. + E2{1}	15514	16985		3.27	(16)	OCC	51.51	141.48
	Sus. + E3{1}	15514	8054		3.27	(16)	OCC	44.50	141.48
	Sus. + E4{1}	15514	8054		3.27	(16)	OCC	44.50	141.48
	Sus. + W1{1}	15514	8115		3.27	(16)	OCC	44.55	141.48
	Sus. + W2{1}	15514	8115		3.27	(16)	OCC	44.55	141.48
	Sus. + W3{1}	15514	3835		3.27	(16)	OCC	41.19	141.48
	Sus. + W4{1}	15514	3835		3.27	(16)	OCC	41.19	141.48
A14 N+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	5856			3.27	(15)	SUST	30.60	117.90
	TR:Amb to T1{1}			29261	3.27	(17)	DISP	30.62	176.85
	Amb to T1{1}			29261	3.27	(17)	DISP	30.62	176.85
	Sus. + E1{1}	5856	13324		3.27	(16)	OCC	41.05	141.48
	Sus. + E2{1}	5856	13324		3.27	(16)	OCC	41.05	141.48
	Sus. + E3{1}	5856	6429		3.27	(16)	OCC	35.64	141.48
	Sus. + E4{1}	5856	6429		3.27	(16)	OCC	35.64	141.48
	Sus. + W1{1}	5856	5729		3.27	(16)	OCC	35.09	141.48
	Sus. + W2{1}	5856	5729		3.27	(16)	OCC	35.09	141.48
	Sus. + W3{1}	5856	3202		3.27	(16)	OCC	33.11	141.48
	Sus. + W4{1}	5856	3202		3.27	(16)	OCC	33.11	141.48
A14 N-	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	5856			1.00	(15)	SUST	27.87	117.90
	TR:Amb to T1{1}			29261	1.00	(17)	DISP	9.37	176.85
	Amb to T1{1}			29261	1.00	(17)	DISP	9.37	176.85
	Sus. + E1{1}	5856	13324		1.00	(16)	OCC	32.14	141.48
	Sus. + E2{1}	5856	13324		1.00	(16)	OCC	32.14	141.48
	Sus. + E3{1}	5856	6429		1.00	(16)	OCC	29.93	141.48
	Sus. + E4{1}	5856	6429		1.00	(16)	OCC	29.93	141.48
	Sus. + W1{1}	5856	5729		1.00	(16)	OCC	29.71	141.48
	Sus. + W2{1}	5856	5729		1.00	(16)	OCC	29.71	141.48
	Sus. + W3{1}	5856	3202		1.00	(16)	OCC	28.90	141.48
	Sus. + W4{1}	5856	3202		1.00	(16)	OCC	28.90	141.48
A13 F+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	16157			1.00	(15)	SUST	31.17	117.90
	TR:Amb to T1{1}			55585	1.00	(17)	DISP	17.79	176.85
	Amb to T1{1}			55585	1.00	(17)	DISP	17.79	176.85
	Sus. + E1{1}	16157	8590		1.00	(16)	OCC	33.92	141.48
	Sus. + E2{1}	16157	8590		1.00	(16)	OCC	33.92	141.48
	Sus. + E3{1}	16157	3927		1.00	(16)	OCC	32.43	141.48
	Sus. + E4{1}	16157	3927		1.00	(16)	OCC	32.43	141.48
	Sus. + W1{1}	16157	4737		1.00	(16)	OCC	32.69	141.48
	Sus. + W2{1}	16157	4737		1.00	(16)	OCC	32.69	141.48
	Sus. + W3{1}	16157	1773		1.00	(16)	OCC	31.74	141.48
	Sus. + W4{1}	16157	1773		1.00	(16)	OCC	31.74	141.48

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		ASME B31.1 (2014)		CODE COMPLIANCE					
		(Moments in N.m )		(Stress in N/mm2 )					
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Load type	Code Stress	Code Allow.
A13 F-	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	16157			3.27	(15)	SUST	38.68	117.90
	TR:Amb to T1{1}			55585	3.27	(17)	DISP	58.17	176.85
	Amb to T1{1}			55585	3.27	(17)	DISP	58.17	176.85
	Sus. + E1{1}	16157	8590		3.27	(16)	OCC	45.42	141.48
	Sus. + E2{1}	16157	8590		3.27	(16)	OCC	45.42	141.48
	Sus. + E3{1}	16157	3927		3.27	(16)	OCC	41.76	141.48
	Sus. + E4{1}	16157	3927		3.27	(16)	OCC	41.76	141.48
	Sus. + W1{1}	16157	4737		3.27	(16)	OCC	42.40	141.48
	Sus. + W2{1}	16157	4737		3.27	(16)	OCC	42.40	141.48
	Sus. + W3{1}	16157	1773		3.27	(16)	OCC	40.07	141.48
	Sus. + W4{1}	16157	1773		3.27	(16)	OCC	40.07	141.48
A13 N-	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	9606			1.00	(15)	SUST	29.07	117.90
	TR:Amb to T1{1}			72380	1.00	(17)	DISP	23.17	176.85
	Amb to T1{1}			72380	1.00	(17)	DISP	23.17	176.85
	Sus. + E1{1}	9606	10950		1.00	(16)	OCC	32.58	141.48
	Sus. + E2{1}	9606	10950		1.00	(16)	OCC	32.58	141.48
	Sus. + E3{1}	9606	5253		1.00	(16)	OCC	30.76	141.48
	Sus. + E4{1}	9606	5253		1.00	(16)	OCC	30.76	141.48
	Sus. + W1{1}	9606	6590		1.00	(16)	OCC	31.18	141.48
	Sus. + W2{1}	9606	6590		1.00	(16)	OCC	31.18	141.48
	Sus. + W3{1}	9606	2622		1.00	(16)	OCC	29.91	141.48
	Sus. + W4{1}	9606	2622		1.00	(16)	OCC	29.91	141.48
A12 +	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	34125			1.00	(15)	SUST	36.92	117.90
	TR:Amb to T1{1}			39100	1.00	(17)	DISP	12.52	176.85
	Amb to T1{1}			39100	1.00	(17)	DISP	12.52	176.85
	Sus. + E1{1}	34125	8411		1.00	(16)	OCC	39.62	141.48
	Sus. + E2{1}	34125	8411		1.00	(16)	OCC	39.62	141.48
	Sus. + E3{1}	34125	9350		1.00	(16)	OCC	39.92	141.48
	Sus. + E4{1}	34125	9350		1.00	(16)	OCC	39.92	141.48
	Sus. + W1{1}	34125	5027		1.00	(16)	OCC	38.53	141.48
	Sus. + W2{1}	34125	5027		1.00	(16)	OCC	38.53	141.48
	Sus. + W3{1}	34125	3239		1.00	(16)	OCC	37.96	141.48
	Sus. + W4{1}	34125	3239		1.00	(16)	OCC	37.96	141.48
A12 -	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	34125			1.00	(15)	SUST	36.92	117.90
	TR:Amb to T1{1}			39100	1.00	(17)	DISP	12.52	176.85
	Amb to T1{1}			39100	1.00	(17)	DISP	12.52	176.85
	Sus. + E1{1}	34125	8411		1.00	(16)	OCC	39.62	141.48
	Sus. + E2{1}	34125	8411		1.00	(16)	OCC	39.62	141.48
	Sus. + E3{1}	34125	9350		1.00	(16)	OCC	39.92	141.48
	Sus. + E4{1}	34125	9350		1.00	(16)	OCC	39.92	141.48
	Sus. + W1{1}	34125	5027		1.00	(16)	OCC	38.53	141.48
	Sus. + W2{1}	34125	5027		1.00	(16)	OCC	38.53	141.48
	Sus. + W3{1}	34125	3239		1.00	(16)	OCC	37.96	141.48
	Sus. + W4{1}	34125	3239		1.00	(16)	OCC	37.96	141.48

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		ASME B31.1 (2014)		CODE COMPLIANCE					
		(Moments in N.m )		(Stress in N/mm2 )					
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Load type	Code Stress	Code Allow.
A11 F+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	33214			1.00	(15)	SUST	36.63	117.90



TR:Amb to T1{1}			40812	1.00	(17)	DISP	13.06	176.85
Amb to T1{1}			40812	1.00	(17)	DISP	13.06	176.85
Sus. + E1{1}	33214	7900		1.00	(16)	OCC	39.16	141.48
Sus. + E2{1}	33214	7900		1.00	(16)	OCC	39.16	141.48
Sus. + E3{1}	33214	8678		1.00	(16)	OCC	39.41	141.48
Sus. + E4{1}	33214	8678		1.00	(16)	OCC	39.41	141.48
Sus. + W1{1}	33214	4875		1.00	(16)	OCC	38.19	141.48
Sus. + W2{1}	33214	4875		1.00	(16)	OCC	38.19	141.48
Sus. + W3{1}	33214	3084		1.00	(16)	OCC	37.62	141.48
Sus. + W4{1}	33214	3084		1.00	(16)	OCC	37.62	141.48
All F- Max P{1}					( 3)	HOOP	72.95	117.90
GR + Max P{1}	33214			3.27	(15)	SUST	52.07	117.90
TR:Amb to T1{1}			40812	3.27	(17)	DISP	42.71	176.85
Amb to T1{1}			40812	3.27	(17)	DISP	42.71	176.85
Sus. + E1{1}	33214	7900		3.27	(16)	OCC	58.27	141.48
Sus. + E2{1}	33214	7900		3.27	(16)	OCC	58.27	141.48
Sus. + E3{1}	33214	8678		3.27	(16)	OCC	58.88	141.48
Sus. + E4{1}	33214	8678		3.27	(16)	OCC	58.88	141.48
Sus. + W1{1}	33214	4875		3.27	(16)	OCC	55.90	141.48
Sus. + W2{1}	33214	4875		3.27	(16)	OCC	55.90	141.48
Sus. + W3{1}	33214	3084		3.27	(16)	OCC	54.49	141.48
Sus. + W4{1}	33214	3084		3.27	(16)	OCC	54.49	141.48
All N+ Max P{1}					( 3)	HOOP	72.95	117.90
GR + Max P{1}	21888			3.27	(15)	SUST	43.18	117.90
TR:Amb to T1{1}			45138	3.27	(17)	DISP	47.24	176.85
Amb to T1{1}			45138	3.27	(17)	DISP	47.24	176.85
Sus. + E1{1}	21888	2996		3.27	(16)	OCC	45.53	141.48
Sus. + E2{1}	21888	2996		3.27	(16)	OCC	45.53	141.48
Sus. + E3{1}	21888	2741		3.27	(16)	OCC	45.33	141.48
Sus. + E4{1}	21888	2741		3.27	(16)	OCC	45.33	141.48
Sus. + W1{1}	21888	2140		3.27	(16)	OCC	44.86	141.48
Sus. + W2{1}	21888	2140		3.27	(16)	OCC	44.86	141.48
Sus. + W3{1}	21888	1436		3.27	(16)	OCC	44.31	141.48
Sus. + W4{1}	21888	1436		3.27	(16)	OCC	44.31	141.48
All N- Max P{1}					( 3)	HOOP	72.95	117.90
GR + Max P{1}	21888			1.00	(15)	SUST	33.01	117.90
TR:Amb to T1{1}			45138	1.00	(17)	DISP	14.45	176.85
Amb to T1{1}			45138	1.00	(17)	DISP	14.45	176.85
Sus. + E1{1}	21888	2996		1.00	(16)	OCC	33.96	141.48
Sus. + E2{1}	21888	2996		1.00	(16)	OCC	33.96	141.48
Sus. + E3{1}	21888	2741		1.00	(16)	OCC	33.88	141.48
Sus. + E4{1}	21888	2741		1.00	(16)	OCC	33.88	141.48
Sus. + W1{1}	21888	2140		1.00	(16)	OCC	33.69	141.48
Sus. + W2{1}	21888	2140		1.00	(16)	OCC	33.69	141.48
Sus. + W3{1}	21888	1436		1.00	(16)	OCC	33.47	141.48
Sus. + W4{1}	21888	1436		1.00	(16)	OCC	33.47	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			Eq. no.	Load type	Code Stress	Code Allow.	
		(Moments in N.m )		(Stress in N/mm2 )					
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.) S.I.F					
A09 F+ Max P{1}					( 3)	HOOP	72.95	117.90	
GR + Max P{1}		68723			1.00	(15)	SUST	48.00	117.90
TR:Amb to T1{1}				89206	1.00	(17)	DISP	28.55	176.85
Amb to T1{1}				89206	1.00	(17)	DISP	28.55	176.85
Sus. + E1{1}		68723	4896		1.00	(16)	OCC	49.56	141.48
Sus. + E2{1}		68723	4896		1.00	(16)	OCC	49.56	141.48
Sus. + E3{1}		68723	6289		1.00	(16)	OCC	50.01	141.48
Sus. + E4{1}		68723	6289		1.00	(16)	OCC	50.01	141.48
Sus. + W1{1}		68723	1976		1.00	(16)	OCC	48.63	141.48
Sus. + W2{1}		68723	1976		1.00	(16)	OCC	48.63	141.48
Sus. + W3{1}		68723	1430		1.00	(16)	OCC	48.45	141.48
Sus. + W4{1}		68723	1430		1.00	(16)	OCC	48.45	141.48
A09 N- Max P{1}					( 3)	HOOP	72.95	117.90	
GR + Max P{1}		38364			1.00	(15)	SUST	38.28	117.90
TR:Amb to T1{1}				86243	1.00	(17)	DISP	27.61	176.85
Amb to T1{1}				86243	1.00	(17)	DISP	27.61	176.85
Sus. + E1{1}		38364	6341		1.00	(16)	OCC	40.31	141.48
Sus. + E2{1}		38364	6341		1.00	(16)	OCC	40.31	141.48

	Sus. + E3{1}	38364	7225		1.00	(16)	OCC	40.59	141.48
	Sus. + E4{1}	38364	7225		1.00	(16)	OCC	40.59	141.48
	Sus. + W1{1}	38364	1623		1.00	(16)	OCC	38.80	141.48
	Sus. + W2{1}	38364	1623		1.00	(16)	OCC	38.80	141.48
	Sus. + W3{1}	38364	1823		1.00	(16)	OCC	38.86	141.48
	Sus. + W4{1}	38364	1823		1.00	(16)	OCC	38.86	141.48
A08	+ Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	30939			1.00	(15)	SUST	35.90	117.90
	TR:Amb to Tl{1}			176087	1.00	(17)	DISP	56.36	176.85
	Amb to Tl{1}			176087	1.00	(17)	DISP	56.36	176.85
	Sus. + E1{1}	30939	58673		1.00	(16)	OCC	54.68	141.48
	Sus. + E2{1}	30939	58673		1.00	(16)	OCC	54.68	141.48
	Sus. + E3{1}	30939	41963		1.00	(16)	OCC	49.33	141.48
	Sus. + E4{1}	30939	41963		1.00	(16)	OCC	49.33	141.48
	Sus. + W1{1}	30939	24825		1.00	(16)	OCC	43.85	141.48
	Sus. + W2{1}	30939	24825		1.00	(16)	OCC	43.85	141.48
	Sus. + W3{1}	30939	13054		1.00	(16)	OCC	40.08	141.48
	Sus. + W4{1}	30939	13054		1.00	(16)	OCC	40.08	141.48
A08	- Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	30939			1.00	(15)	SUST	35.90	117.90
	TR:Amb to Tl{1}			176087	1.00	(17)	DISP	56.36	176.85
	Amb to Tl{1}			176087	1.00	(17)	DISP	56.36	176.85
	Sus. + E1{1}	30939	58673		1.00	(16)	OCC	54.68	141.48
	Sus. + E2{1}	30939	58673		1.00	(16)	OCC	54.68	141.48
	Sus. + E3{1}	30939	41963		1.00	(16)	OCC	49.33	141.48
	Sus. + E4{1}	30939	41963		1.00	(16)	OCC	49.33	141.48
	Sus. + W1{1}	30939	24825		1.00	(16)	OCC	43.85	141.48
	Sus. + W2{1}	30939	24825		1.00	(16)	OCC	43.85	141.48
	Sus. + W3{1}	30939	13054		1.00	(16)	OCC	40.08	141.48
	Sus. + W4{1}	30939	13054		1.00	(16)	OCC	40.08	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
		(Moments in N.m )			(Stress in N/mm2 )				
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type	Code Stress	Code Allow.
A07 F+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	48583			1.00	(15)	SUST	41.55	117.90
	TR:Amb to Tl{1}			17233	1.00	(17)	DISP	5.52	176.85
	Amb to Tl{1}			17233	1.00	(17)	DISP	5.52	176.85
	Sus. + E1{1}	48583	4339		1.00	(16)	OCC	42.94	141.48
	Sus. + E2{1}	48583	4339		1.00	(16)	OCC	42.94	141.48
	Sus. + E3{1}	48583	10426		1.00	(16)	OCC	44.89	141.48
	Sus. + E4{1}	48583	10426		1.00	(16)	OCC	44.89	141.48
	Sus. + W1{1}	48583	2310		1.00	(16)	OCC	42.29	141.48
	Sus. + W2{1}	48583	2310		1.00	(16)	OCC	42.29	141.48
	Sus. + W3{1}	48583	2594		1.00	(16)	OCC	42.38	141.48
	Sus. + W4{1}	48583	2594		1.00	(16)	OCC	42.38	141.48
A07 N-	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	46593			1.00	(15)	SUST	40.91	117.90
	TR:Amb to Tl{1}			14003	1.00	(17)	DISP	4.48	176.85
	Amb to Tl{1}			14003	1.00	(17)	DISP	4.48	176.85
	Sus. + E1{1}	46593	5307		1.00	(16)	OCC	42.61	141.48
	Sus. + E2{1}	46593	5307		1.00	(16)	OCC	42.61	141.48
	Sus. + E3{1}	46593	10836		1.00	(16)	OCC	44.38	141.48
	Sus. + E4{1}	46593	10836		1.00	(16)	OCC	44.38	141.48
	Sus. + W1{1}	46593	1634		1.00	(16)	OCC	41.44	141.48
	Sus. + W2{1}	46593	1634		1.00	(16)	OCC	41.44	141.48
	Sus. + W3{1}	46593	2767		1.00	(16)	OCC	41.80	141.48
	Sus. + W4{1}	46593	2767		1.00	(16)	OCC	41.80	141.48
A06 F+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	37683			1.00	(15)	SUST	38.06	117.90
	TR:Amb to Tl{1}			55702	1.00	(17)	DISP	17.83	176.85
	Amb to Tl{1}			55702	1.00	(17)	DISP	17.83	176.85
	Sus. + E1{1}	37683	14606		1.00	(16)	OCC	42.74	141.48
	Sus. + E2{1}	37683	14606		1.00	(16)	OCC	42.74	141.48
	Sus. + E3{1}	37683	11815		1.00	(16)	OCC	41.84	141.48
	Sus. + E4{1}	37683	11815		1.00	(16)	OCC	41.84	141.48
	Sus. + W1{1}	37683	4165		1.00	(16)	OCC	39.40	141.48
	Sus. + W2{1}	37683	4165		1.00	(16)	OCC	39.40	141.48

Sus. + W3{1}	37683	3405		1.00	(16)	OCC	39.15	141.48
Sus. + W4{1}	37683	3405		1.00	(16)	OCC	39.15	141.48
A06 N- Max P{1}					( 3)	HOOP	72.95	117.90
GR + Max P{1}	37514			1.00	(15)	SUST	38.01	117.90
TR:Amb to T1{1}			58790	1.00	(17)	DISP	18.82	176.85
Amb to T1{1}			58790	1.00	(17)	DISP	18.82	176.85
Sus. + E1{1}	37514	14988		1.00	(16)	OCC	42.81	141.48
Sus. + E2{1}	37514	14988		1.00	(16)	OCC	42.81	141.48
Sus. + E3{1}	37514	11594		1.00	(16)	OCC	41.72	141.48
Sus. + E4{1}	37514	11594		1.00	(16)	OCC	41.72	141.48
Sus. + W1{1}	37514	4320		1.00	(16)	OCC	39.39	141.48
Sus. + W2{1}	37514	4320		1.00	(16)	OCC	39.39	141.48
Sus. + W3{1}	37514	3326		1.00	(16)	OCC	39.07	141.48
Sus. + W4{1}	37514	3326		1.00	(16)	OCC	39.07	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Moments in N.m )		(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma	Mb	Mc	S.I.F	Eq. Load no.	type		
		(Sus.)	(Occ.)	(Exp.)					
A05 F+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	22131			1.00	(15)	SUST	33.08	117.90
	TR:Amb to T1{1}			108971	1.00	(17)	DISP	34.88	176.85
	Amb to T1{1}			108971	1.00	(17)	DISP	34.88	176.85
	Sus. + E1{1}	22131	17950		1.00	(16)	OCC	38.83	141.48
	Sus. + E2{1}	22131	17950		1.00	(16)	OCC	38.83	141.48
	Sus. + E3{1}	22131	7978		1.00	(16)	OCC	35.64	141.48
	Sus. + E4{1}	22131	7978		1.00	(16)	OCC	35.64	141.48
	Sus. + W1{1}	22131	4966		1.00	(16)	OCC	34.67	141.48
	Sus. + W2{1}	22131	4966		1.00	(16)	OCC	34.67	141.48
	Sus. + W3{1}	22131	1628		1.00	(16)	OCC	33.60	141.48
	Sus. + W4{1}	22131	1628		1.00	(16)	OCC	33.60	141.48
A05 N-	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	22612			1.00	(15)	SUST	33.24	117.90
	TR:Amb to T1{1}			113643	1.00	(17)	DISP	36.38	176.85
	Amb to T1{1}			113643	1.00	(17)	DISP	36.38	176.85
	Sus. + E1{1}	22612	14573		1.00	(16)	OCC	37.90	141.48
	Sus. + E2{1}	22612	14573		1.00	(16)	OCC	37.90	141.48
	Sus. + E3{1}	22612	9621		1.00	(16)	OCC	36.32	141.48
	Sus. + E4{1}	22612	9621		1.00	(16)	OCC	36.32	141.48
	Sus. + W1{1}	22612	3725		1.00	(16)	OCC	34.43	141.48
	Sus. + W2{1}	22612	3725		1.00	(16)	OCC	34.43	141.48
	Sus. + W3{1}	22612	2419		1.00	(16)	OCC	34.01	141.48
	Sus. + W4{1}	22612	2419		1.00	(16)	OCC	34.01	141.48
A04 F+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	20744			1.00	(15)	SUST	32.64	117.90
	TR:Amb to T1{1}			93017	1.00	(17)	DISP	29.77	176.85
	Amb to T1{1}			93017	1.00	(17)	DISP	29.77	176.85
	Sus. + E1{1}	20744	11953		1.00	(16)	OCC	36.47	141.48
	Sus. + E2{1}	20744	11953		1.00	(16)	OCC	36.47	141.48
	Sus. + E3{1}	20744	12179		1.00	(16)	OCC	36.54	141.48
	Sus. + E4{1}	20744	12179		1.00	(16)	OCC	36.54	141.48
	Sus. + W1{1}	20744	3099		1.00	(16)	OCC	33.63	141.48
	Sus. + W2{1}	20744	3099		1.00	(16)	OCC	33.63	141.48
	Sus. + W3{1}	20744	2870		1.00	(16)	OCC	33.56	141.48
	Sus. + W4{1}	20744	2870		1.00	(16)	OCC	33.56	141.48
A04 N+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	20539			3.27	(15)	SUST	42.12	117.90
	TR:Amb to T1{1}			63589	3.27	(17)	DISP	66.55	176.85
	Amb to T1{1}			63589	3.27	(17)	DISP	66.55	176.85
	Sus. + E1{1}	20539	18240		3.27	(16)	OCC	56.44	141.48
	Sus. + E2{1}	20539	18240		3.27	(16)	OCC	56.44	141.48
	Sus. + E3{1}	20539	9417		3.27	(16)	OCC	49.51	141.48
	Sus. + E4{1}	20539	9417		3.27	(16)	OCC	49.51	141.48
	Sus. + W1{1}	20539	5239		3.27	(16)	OCC	46.23	141.48
	Sus. + W2{1}	20539	5239		3.27	(16)	OCC	46.23	141.48
	Sus. + W3{1}	20539	2149		3.27	(16)	OCC	43.81	141.48
	Sus. + W4{1}	20539	2149		3.27	(16)	OCC	43.81	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A04 N-	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	20539			1.00	(15) SUST	32.57	117.90
	TR:Amb to T1{1}			63589	1.00	(17) DISP	20.35	176.85
	Amb to T1{1}			63589	1.00	(17) DISP	20.35	176.85
	Sus. + E1{1}	20539	18240		1.00	(16) OCC	38.41	141.48
	Sus. + E2{1}	20539	18240		1.00	(16) OCC	38.41	141.48
	Sus. + E3{1}	20539	9417		1.00	(16) OCC	35.59	141.48
	Sus. + E4{1}	20539	9417		1.00	(16) OCC	35.59	141.48
	Sus. + W1{1}	20539	5239		1.00	(16) OCC	34.25	141.48
	Sus. + W2{1}	20539	5239		1.00	(16) OCC	34.25	141.48
	Sus. + W3{1}	20539	2149		1.00	(16) OCC	33.26	141.48
	Sus. + W4{1}	20539	2149		1.00	(16) OCC	33.26	141.48
A03 +	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	53897			1.00	(15) SUST	43.25	117.90
	TR:Amb to T1{1}			49295	1.00	(17) DISP	15.78	176.85
	Amb to T1{1}			49295	1.00	(17) DISP	15.78	176.85
	Sus. + E1{1}	53897	24417		1.00	(16) OCC	51.07	141.48
	Sus. + E2{1}	53897	24417		1.00	(16) OCC	51.07	141.48
	Sus. + E3{1}	53897	27982		1.00	(16) OCC	52.21	141.48
	Sus. + E4{1}	53897	27982		1.00	(16) OCC	52.21	141.48
	Sus. + W1{1}	53897	6168		1.00	(16) OCC	45.23	141.48
	Sus. + W2{1}	53897	6168		1.00	(16) OCC	45.23	141.48
	Sus. + W3{1}	53897	6877		1.00	(16) OCC	45.45	141.48
	Sus. + W4{1}	53897	6877		1.00	(16) OCC	45.45	141.48
A03 -	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	53897			1.00	(15) SUST	43.25	117.90
	TR:Amb to T1{1}			49295	1.00	(17) DISP	15.78	176.85
	Amb to T1{1}			49295	1.00	(17) DISP	15.78	176.85
	Sus. + E1{1}	53897	24417		1.00	(16) OCC	51.07	141.48
	Sus. + E2{1}	53897	24417		1.00	(16) OCC	51.07	141.48
	Sus. + E3{1}	53897	27982		1.00	(16) OCC	52.21	141.48
	Sus. + E4{1}	53897	27982		1.00	(16) OCC	52.21	141.48
	Sus. + W1{1}	53897	6168		1.00	(16) OCC	45.23	141.48
	Sus. + W2{1}	53897	6168		1.00	(16) OCC	45.23	141.48
	Sus. + W3{1}	53897	6877		1.00	(16) OCC	45.45	141.48
	Sus. + W4{1}	53897	6877		1.00	(16) OCC	45.45	141.48
A02 F+	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	31598			1.00	(15) SUST	36.11	117.90
	TR:Amb to T1{1}			63900	1.00	(17) DISP	20.45	176.85
	Amb to T1{1}			63900	1.00	(17) DISP	20.45	176.85
	Sus. + E1{1}	31598	25302		1.00	(16) OCC	44.21	141.48
	Sus. + E2{1}	31598	25302		1.00	(16) OCC	44.21	141.48
	Sus. + E3{1}	31598	18651		1.00	(16) OCC	42.08	141.48
	Sus. + E4{1}	31598	18651		1.00	(16) OCC	42.08	141.48
	Sus. + W1{1}	31598	6060		1.00	(16) OCC	38.05	141.48
	Sus. + W2{1}	31598	6060		1.00	(16) OCC	38.05	141.48
	Sus. + W3{1}	31598	4230		1.00	(16) OCC	37.47	141.48
	Sus. + W4{1}	31598	4230		1.00	(16) OCC	37.47	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A02 F-	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	31598			3.27	(15) SUST	50.80	117.90

TR:Amb to T1{1}			63900	3.27	(17)	DISP	66.87	176.85
Amb to T1{1}			63900	3.27	(17)	DISP	66.87	176.85
Sus. + E1{1}	31598	25302		3.27	(16)	OCC	70.66	141.48
Sus. + E2{1}	31598	25302		3.27	(16)	OCC	70.66	141.48
Sus. + E3{1}	31598	18651		3.27	(16)	OCC	65.44	141.48
Sus. + E4{1}	31598	18651		3.27	(16)	OCC	65.44	141.48
Sus. + W1{1}	31598	6060		3.27	(16)	OCC	55.56	141.48
Sus. + W2{1}	31598	6060		3.27	(16)	OCC	55.56	141.48
Sus. + W3{1}	31598	4230		3.27	(16)	OCC	54.12	141.48
Sus. + W4{1}	31598	4230		3.27	(16)	OCC	54.12	141.48
A02 N-								
Max P{1}					( 3)	HOOP	72.95	117.90
GR + Max P{1}	15442			1.00	(15)	SUST	30.94	117.90
TR:Amb to T1{1}			71307	1.00	(17)	DISP	22.82	176.85
Amb to T1{1}			71307	1.00	(17)	DISP	22.82	176.85
Sus. + E1{1}	15442	13293		1.00	(16)	OCC	35.20	141.48
Sus. + E2{1}	15442	13293		1.00	(16)	OCC	35.20	141.48
Sus. + E3{1}	15442	11153		1.00	(16)	OCC	34.51	141.48
Sus. + E4{1}	15442	11153		1.00	(16)	OCC	34.51	141.48
Sus. + W1{1}	15442	3040		1.00	(16)	OCC	31.92	141.48
Sus. + W2{1}	15442	3040		1.00	(16)	OCC	31.92	141.48
Sus. + W3{1}	15442	2296		1.00	(16)	OCC	31.68	141.48
Sus. + W4{1}	15442	2296		1.00	(16)	OCC	31.68	141.48
A01								
Max P{1}					( 3)	HOOP	72.95	117.90
GR + Max P{1}	13283			1.00	(15)	SUST	30.25	117.90
TR:Amb to T1{1}			69738	1.00	(17)	DISP	22.32	176.85
Amb to T1{1}			69738	1.00	(17)	DISP	22.32	176.85
Sus. + E1{1}	13283	5174		1.00	(16)	OCC	31.91	141.48
Sus. + E2{1}	13283	5174		1.00	(16)	OCC	31.91	141.48
Sus. + E3{1}	13283	10559		1.00	(16)	OCC	33.63	141.48
Sus. + E4{1}	13283	10559		1.00	(16)	OCC	33.63	141.48
Sus. + W1{1}	13283	882		1.00	(16)	OCC	30.53	141.48
Sus. + W2{1}	13283	882		1.00	(16)	OCC	30.53	141.48
Sus. + W3{1}	13283	2162		1.00	(16)	OCC	30.94	141.48
Sus. + W4{1}	13283	2162		1.00	(16)	OCC	30.94	141.48

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R E S U L T S U M M A R Y  
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Maximum sustained stress ratio

Point : A07 F  
Stress N/mm2 : 104.19  
Allowable N/mm2 : 117.90  
Ratio : 0.88  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A06 N  
Stress N/mm2 : 126.16  
Allowable N/mm2 : 176.85  
Ratio : 0.71  
Load combination : Max Range

Maximum occasional stress ratio

Point : A07 F  
Stress N/mm2 : 120.97  
Allowable N/mm2 : 141.48  
Ratio : 0.86  
Load combination : Sus. + E3{1}

Maximum hoop stress ratio

Point : A06 N  
Stress N/mm2 : 72.95  
Allowable N/mm2 : 117.90  
Ratio : 0.62  
Load combination : Max P{1}

## **LAMPIRAN B**

*GENERAL PIPE STRESS REPORT (HYDROTEST CONDITION  
WITHOUT EXPANSION JOINT, PIPE THICKNESS = 9,525 mm)*

Hydrotest Condition without Expansion  
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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A02 N+	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	19651			3.27	(15) SUST	41.42	117.90
	TR:Amb to T1{1}			222792	3.27	(17) DISP	233.15	176.85**
	with Sus. load margin						233.15	253.33
	Amb to T1{1}			222792	3.27	(17) DISP	233.15	176.85**
	with Sus. load margin						233.15	253.33
	Sus. + E1{1}	19651	9179		3.27	(16) OCC	48.63	141.48
	Sus. + E2{1}	19651	9179		3.27	(16) OCC	48.63	141.48
	Sus. + E3{1}	19651	11362		3.27	(16) OCC	50.34	141.48
	Sus. + E4{1}	19651	11362		3.27	(16) OCC	50.34	141.48
	Sus. + W1{1}	19651	2512		3.27	(16) OCC	43.40	141.48
	Sus. + W2{1}	19651	2512		3.27	(16) OCC	43.40	141.48
	Sus. + W3{1}	19651	2679		3.27	(16) OCC	43.53	141.48
	Sus. + W4{1}	19651	2679		3.27	(16) OCC	43.53	141.48
A02 F-	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	28379			3.27	(15) SUST	48.27	117.90
	TR:Amb to T1{1}			211852	3.27	(17) DISP	221.70	176.85**
	with Sus. load margin						221.70	246.48
	Amb to T1{1}			211852	3.27	(17) DISP	221.70	176.85**
	with Sus. load margin						221.70	246.48
	Sus. + E1{1}	28379	7303		3.27	(16) OCC	54.01	141.48
	Sus. + E2{1}	28379	7303		3.27	(16) OCC	54.01	141.48
	Sus. + E3{1}	28379	11884		3.27	(16) OCC	57.60	141.48
	Sus. + E4{1}	28379	11884		3.27	(16) OCC	57.60	141.48
	Sus. + W1{1}	28379	2257		3.27	(16) OCC	50.05	141.48
	Sus. + W2{1}	28379	2257		3.27	(16) OCC	50.05	141.48
	Sus. + W3{1}	28379	2852		3.27	(16) OCC	50.51	141.48
	Sus. + W4{1}	28379	2852		3.27	(16) OCC	50.51	141.48
A04 N+	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	27003			3.27	(15) SUST	47.19	117.90
	TR:Amb to T1{1}			165977	3.27	(17) DISP	173.69	176.85
	Amb to T1{1}			165977	3.27	(17) DISP	173.69	176.85
	Sus. + E1{1}	27003	16512		3.27	(16) OCC	60.15	141.48
	Sus. + E2{1}	27003	16512		3.27	(16) OCC	60.15	141.48
	Sus. + E3{1}	27003	7311		3.27	(16) OCC	52.93	141.48
	Sus. + E4{1}	27003	7311		3.27	(16) OCC	52.93	141.48
	Sus. + W1{1}	27003	5578		3.27	(16) OCC	51.57	141.48
	Sus. + W2{1}	27003	5578		3.27	(16) OCC	51.57	141.48
	Sus. + W3{1}	27003	1625		3.27	(16) OCC	48.47	141.48
	Sus. + W4{1}	27003	1625		3.27	(16) OCC	48.47	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A05 F-	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	12540			3.27	(15) SUST	35.84	117.90
	TR:Amb to T1{1}			157727	3.27	(17) DISP	165.06	176.85
	Amb to T1{1}			157727	3.27	(17) DISP	165.06	176.85
	Sus. + E1{1}	12540	11108		3.27	(16) OCC	44.56	141.48
	Sus. + E2{1}	12540	11108		3.27	(16) OCC	44.56	141.48
	Sus. + E3{1}	12540	2941		3.27	(16) OCC	38.15	141.48
	Sus. + E4{1}	12540	2941		3.27	(16) OCC	38.15	141.48
	Sus. + W1{1}	12540	3802		3.27	(16) OCC	38.83	141.48
	Sus. + W2{1}	12540	3802		3.27	(16) OCC	38.83	141.48

	Sus. + W3{1}	12540	804		3.27	(16)	OCC	36.47	141.48
	Sus. + W4{1}	12540	804		3.27	(16)	OCC	36.47	141.48
A05 N+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	9154			3.27	(15)	SUST	33.18	117.90
	TR:Amb to T1{1}			135035	3.27	(17)	DISP	141.31	176.85
	Amb to T1{1}			135035	3.27	(17)	DISP	141.31	176.85
	Sus. + E1{1}	9154	6945		3.27	(16)	OCC	38.64	141.48
	Sus. + E2{1}	9154	6945		3.27	(16)	OCC	38.64	141.48
	Sus. + E3{1}	9154	6499		3.27	(16)	OCC	38.29	141.48
	Sus. + E4{1}	9154	6499		3.27	(16)	OCC	38.29	141.48
	Sus. + W1{1}	9154	2304		3.27	(16)	OCC	34.99	141.48
	Sus. + W2{1}	9154	2304		3.27	(16)	OCC	34.99	141.48
	Sus. + W3{1}	9154	2130		3.27	(16)	OCC	34.86	141.48
	Sus. + W4{1}	9154	2130		3.27	(16)	OCC	34.86	141.48
A06 N+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	37273			6.70	(15)	SUST	85.99	117.90
	TR:Amb to T1{1}			57518	6.70	(17)	DISP	123.43	176.85
	Amb to T1{1}			57518	6.70	(17)	DISP	123.43	176.85
	Sus. + E1{1}	37273	12481		6.70	(16)	OCC	106.08	141.48
	Sus. + E2{1}	37273	12481		6.70	(16)	OCC	106.08	141.48
	Sus. + E3{1}	37273	10146		6.70	(16)	OCC	102.32	141.48
	Sus. + E4{1}	37273	10146		6.70	(16)	OCC	102.32	141.48
	Sus. + W1{1}	37273	4093		6.70	(16)	OCC	92.58	141.48
	Sus. + W2{1}	37273	4093		6.70	(16)	OCC	92.58	141.48
	Sus. + W3{1}	37273	3312		6.70	(16)	OCC	91.32	141.48
	Sus. + W4{1}	37273	3312		6.70	(16)	OCC	91.32	141.48
A06 F-	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	37442			6.70	(15)	SUST	86.26	117.90
	TR:Amb to T1{1}			57292	6.70	(17)	DISP	122.95	176.85
	Amb to T1{1}			57292	6.70	(17)	DISP	122.95	176.85
	Sus. + E1{1}	37442	12466		6.70	(16)	OCC	106.33	141.48
	Sus. + E2{1}	37442	12466		6.70	(16)	OCC	106.33	141.48
	Sus. + E3{1}	37442	10567		6.70	(16)	OCC	103.27	141.48
	Sus. + E4{1}	37442	10567		6.70	(16)	OCC	103.27	141.48
	Sus. + W1{1}	37442	4022		6.70	(16)	OCC	92.74	141.48
	Sus. + W2{1}	37442	4022		6.70	(16)	OCC	92.74	141.48
	Sus. + W3{1}	37442	3431		6.70	(16)	OCC	91.79	141.48
	Sus. + W4{1}	37442	3431		6.70	(16)	OCC	91.79	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type		
A09 N+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	35884			3.27	(15)	SUST	54.16	117.90
	TR:Amb to T1{1}			109023	3.27	(17)	DISP	114.09	176.85
	Amb to T1{1}			109023	3.27	(17)	DISP	114.09	176.85
	Sus. + E1{1}	35884	3995		3.27	(16)	OCC	57.30	141.48
	Sus. + E2{1}	35884	3995		3.27	(16)	OCC	57.30	141.48
	Sus. + E3{1}	35884	2737		3.27	(16)	OCC	56.31	141.48
	Sus. + E4{1}	35884	2737		3.27	(16)	OCC	56.31	141.48
	Sus. + W1{1}	35884	881		3.27	(16)	OCC	54.86	141.48
	Sus. + W2{1}	35884	881		3.27	(16)	OCC	54.86	141.48
	Sus. + W3{1}	35884	941		3.27	(16)	OCC	54.90	141.48
	Sus. + W4{1}	35884	941		3.27	(16)	OCC	54.90	141.48
A03 +	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	72756			1.00	(15)	SUST	49.29	117.90
	TR:Amb to T1{1}			318926	1.00	(17)	DISP	102.08	176.85
	Amb to T1{1}			318926	1.00	(17)	DISP	102.08	176.85
	Sus. + E1{1}	72756	14854		1.00	(16)	OCC	54.04	141.48
	Sus. + E2{1}	72756	14854		1.00	(16)	OCC	54.04	141.48
	Sus. + E3{1}	72756	34740		1.00	(16)	OCC	60.41	141.48
	Sus. + E4{1}	72756	34740		1.00	(16)	OCC	60.41	141.48
	Sus. + W1{1}	72756	5086		1.00	(16)	OCC	50.92	141.48
	Sus. + W2{1}	72756	5086		1.00	(16)	OCC	50.92	141.48
	Sus. + W3{1}	72756	8581		1.00	(16)	OCC	52.03	141.48
	Sus. + W4{1}	72756	8581		1.00	(16)	OCC	52.03	141.48
A03 -	Max P{1}					( 3)	HOOP	72.95	117.90



GR + Max P{1}	72756			1.00	(15)	SUST	49.29	117.90
TR:Amb to T1{1}				1.00	(17)	DISP	102.08	176.85
Amb to T1{1}			318926	1.00	(17)	DISP	102.08	176.85
Sus. + E1{1}	72756	14854		1.00	(16)	OCC	54.04	141.48
Sus. + E2{1}	72756	14854		1.00	(16)	OCC	54.04	141.48
Sus. + E3{1}	72756	34740		1.00	(16)	OCC	60.41	141.48
Sus. + E4{1}	72756	34740		1.00	(16)	OCC	60.41	141.48
Sus. + W1{1}	72756	5086		1.00	(16)	OCC	50.92	141.48
Sus. + W2{1}	72756	5086		1.00	(16)	OCC	50.92	141.48
Sus. + W3{1}	72756	8581		1.00	(16)	OCC	52.03	141.48
Sus. + W4{1}	72756	8581		1.00	(16)	OCC	52.03	141.48
A08 + Max P{1}								
GR + Max P{1}	26545			1.00	(15)	SUST	34.50	117.90
TR:Amb to T1{1}				1.00	(17)	DISP	97.79	176.85
Amb to T1{1}			305514	1.00	(17)	DISP	97.79	176.85
Sus. + E1{1}	26545	52457		1.00	(16)	OCC	51.29	141.48
Sus. + E2{1}	26545	52457		1.00	(16)	OCC	51.29	141.48
Sus. + E3{1}	26545	33215		1.00	(16)	OCC	45.13	141.48
Sus. + E4{1}	26545	33215		1.00	(16)	OCC	45.13	141.48
Sus. + W1{1}	26545	22707		1.00	(16)	OCC	41.77	141.48
Sus. + W2{1}	26545	22707		1.00	(16)	OCC	41.77	141.48
Sus. + W3{1}	26545	10880		1.00	(16)	OCC	37.98	141.48
Sus. + W4{1}	26545	10880		1.00	(16)	OCC	37.98	141.48

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ASME B31.1 (2014) CODE COMPLIANCE								
			(Moments in N.m )			(Stress in N/mm2 )		
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.
A08 -	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	26545			1.00	(15) SUST	34.50	117.90
	TR:Amb to T1{1}				1.00	(17) DISP	97.79	176.85
	Amb to T1{1}			305514	1.00	(17) DISP	97.79	176.85
	Sus. + E1{1}	26545	52457		1.00	(16) OCC	51.29	141.48
	Sus. + E2{1}	26545	52457		1.00	(16) OCC	51.29	141.48
	Sus. + E3{1}	26545	33215		1.00	(16) OCC	45.13	141.48
	Sus. + E4{1}	26545	33215		1.00	(16) OCC	45.13	141.48
	Sus. + W1{1}	26545	22707		1.00	(16) OCC	41.77	141.48
	Sus. + W2{1}	26545	22707		1.00	(16) OCC	41.77	141.48
	Sus. + W3{1}	26545	10880		1.00	(16) OCC	37.98	141.48
	Sus. + W4{1}	26545	10880		1.00	(16) OCC	37.98	141.48
A07 N+								
	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	32771			6.70	(15) SUST	78.74	117.90
	TR:Amb to T1{1}				6.70	(17) DISP	97.44	176.85
	Amb to T1{1}			45405	6.70	(17) DISP	97.44	176.85
	Sus. + E1{1}	32771	3814		6.70	(16) OCC	84.88	141.48
	Sus. + E2{1}	32771	3814		6.70	(16) OCC	84.88	141.48
	Sus. + E3{1}	32771	7434		6.70	(16) OCC	90.71	141.48
	Sus. + E4{1}	32771	7434		6.70	(16) OCC	90.71	141.48
	Sus. + W1{1}	32771	1564		6.70	(16) OCC	81.26	141.48
	Sus. + W2{1}	32771	1564		6.70	(16) OCC	81.26	141.48
	Sus. + W3{1}	32771	2204		6.70	(16) OCC	82.29	141.48
	Sus. + W4{1}	32771	2204		6.70	(16) OCC	82.29	141.48
A04 F-								
	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	11477			3.27	(15) SUST	35.01	117.90
	TR:Amb to T1{1}				3.27	(17) DISP	94.17	176.85
	Amb to T1{1}			89990	3.27	(17) DISP	94.17	176.85
	Sus. + E1{1}	11477	9232		3.27	(16) OCC	42.25	141.48
	Sus. + E2{1}	11477	9232		3.27	(16) OCC	42.25	141.48
	Sus. + E3{1}	11477	6093		3.27	(16) OCC	39.79	141.48
	Sus. + E4{1}	11477	6093		3.27	(16) OCC	39.79	141.48
	Sus. + W1{1}	11477	3055		3.27	(16) OCC	37.41	141.48
	Sus. + W2{1}	11477	3055		3.27	(16) OCC	37.41	141.48
	Sus. + W3{1}	11477	1582		3.27	(16) OCC	36.25	141.48
	Sus. + W4{1}	11477	1582		3.27	(16) OCC	36.25	141.48
A07 F-								
	Max P{1}					( 3) HOOP	72.95	117.90
	GR + Max P{1}	34954			6.70	(15) SUST	82.26	117.90
	TR:Amb to T1{1}				6.70	(17) DISP	89.53	176.85
	Amb to T1{1}			41721	6.70	(17) DISP	89.53	176.85
	Sus. + E1{1}	34954	3844		6.70	(16) OCC	88.44	141.48

Sus. + E2{1}	34954	3844	6.70	(16)	OCC	88.44	141.48
Sus. + E3{1}	34954	6629	6.70	(16)	OCC	92.93	141.48
Sus. + E4{1}	34954	6629	6.70	(16)	OCC	92.93	141.48
Sus. + W1{1}	34954	2197	6.70	(16)	OCC	85.79	141.48
Sus. + W2{1}	34954	2197	6.70	(16)	OCC	85.79	141.48
Sus. + W3{1}	34954	1964	6.70	(16)	OCC	85.42	141.48
Sus. + W4{1}	34954	1964	6.70	(16)	OCC	85.42	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A09 F-	Max P{1}				( 3)	HOOP	72.95	117.90
	GR + Max P{1}	62605			3.27	(15) SUST	75.14	117.90
	TR:Amb to Tl{1}			87718	3.27	(17) DISP	91.80	176.85
	Amb to Tl{1}			87718	3.27	(17) DISP	91.80	176.85
	Sus. + E1{1}	62605	1990		3.27	(16) OCC	76.70	141.48
	Sus. + E2{1}	62605	1990		3.27	(16) OCC	76.70	141.48
	Sus. + E3{1}	62605	2825		3.27	(16) OCC	77.35	141.48
	Sus. + E4{1}	62605	2825		3.27	(16) OCC	77.35	141.48
	Sus. + W1{1}	62605	1734		3.27	(16) OCC	76.50	141.48
	Sus. + W2{1}	62605	1734		3.27	(16) OCC	76.50	141.48
	Sus. + W3{1}	62605	804		3.27	(16) OCC	75.77	141.48
	Sus. + W4{1}	62605	804		3.27	(16) OCC	75.77	141.48
A10 +	Max P{1}				( 3)	HOOP	72.95	117.90
	GR + Max P{1}	175805			1.00	(15) SUST	82.27	117.90
	TR:Amb to Tl{1}			20810	1.00	(17) DISP	6.66	176.85
	Amb to Tl{1}			20810	1.00	(17) DISP	6.66	176.85
	Sus. + E1{1}	175805	1182		1.00	(16) OCC	82.65	141.48
	Sus. + E2{1}	175805	1182		1.00	(16) OCC	82.65	141.48
	Sus. + E3{1}	175805	2800		1.00	(16) OCC	83.17	141.48
	Sus. + E4{1}	175805	2800		1.00	(16) OCC	83.17	141.48
	Sus. + W1{1}	175805	1665		1.00	(16) OCC	82.81	141.48
	Sus. + W2{1}	175805	1665		1.00	(16) OCC	82.81	141.48
	Sus. + W3{1}	175805	915		1.00	(16) OCC	82.57	141.48
	Sus. + W4{1}	175805	915		1.00	(16) OCC	82.57	141.48
A10 -	Max P{1}				( 3)	HOOP	72.95	117.90
	GR + Max P{1}	175805			1.00	(15) SUST	82.27	117.90
	TR:Amb to Tl{1}			20810	1.00	(17) DISP	6.66	176.85
	Amb to Tl{1}			20810	1.00	(17) DISP	6.66	176.85
	Sus. + E1{1}	175805	1182		1.00	(16) OCC	82.65	141.48
	Sus. + E2{1}	175805	1182		1.00	(16) OCC	82.65	141.48
	Sus. + E3{1}	175805	2800		1.00	(16) OCC	83.17	141.48
	Sus. + E4{1}	175805	2800		1.00	(16) OCC	83.17	141.48
	Sus. + W1{1}	175805	1665		1.00	(16) OCC	82.81	141.48
	Sus. + W2{1}	175805	1665		1.00	(16) OCC	82.81	141.48
	Sus. + W3{1}	175805	915		1.00	(16) OCC	82.57	141.48
	Sus. + W4{1}	175805	915		1.00	(16) OCC	82.57	141.48
A00	Max P{1}				( 3)	HOOP	72.95	117.90
	GR + Max P{1}	25002			1.00	(15) SUST	34.00	117.90
	TR:Amb to Tl{1}			230485	1.00	(17) DISP	73.77	176.85
	Amb to Tl{1}			230485	1.00	(17) DISP	73.77	176.85
	Sus. + E1{1}	25002	19773		1.00	(16) OCC	40.33	141.48
	Sus. + E2{1}	25002	19773		1.00	(16) OCC	40.33	141.48
	Sus. + E3{1}	25002	19804		1.00	(16) OCC	40.34	141.48
	Sus. + E4{1}	25002	19804		1.00	(16) OCC	40.34	141.48
	Sus. + W1{1}	25002	5177		1.00	(16) OCC	35.66	141.48
	Sus. + W2{1}	25002	5177		1.00	(16) OCC	35.66	141.48
	Sus. + W3{1}	25002	4548		1.00	(16) OCC	35.46	141.48
	Sus. + W4{1}	25002	4548		1.00	(16) OCC	35.46	141.48

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Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Load type		
A15	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	8279			1.00	(15)	SUST	28.65	117.90
	TR:Amb to T1{1}			12055	1.00	(17)	DISP	3.86	176.85
	Amb to T1{1}			12055	1.00	(17)	DISP	3.86	176.85
	Sus. + E1{1}	8279	32347		1.00	(16)	OCC	39.00	141.48
	Sus. + E2{1}	8279	32347		1.00	(16)	OCC	39.00	141.48
	Sus. + E3{1}	8279	31668		1.00	(16)	OCC	38.79	141.48
	Sus. + E4{1}	8279	31668		1.00	(16)	OCC	38.79	141.48
	Sus. + W1{1}	8279	17525		1.00	(16)	OCC	34.26	141.48
	Sus. + W2{1}	8279	17525		1.00	(16)	OCC	34.26	141.48
	Sus. + W3{1}	8279	13642		1.00	(16)	OCC	33.02	141.48
	Sus. + W4{1}	8279	13642		1.00	(16)	OCC	33.02	141.48
	A14 F+	Max P{1}					( 3)	HOOP	72.95
GR + Max P{1}		13287			1.00	(15)	SUST	30.25	117.90
TR:Amb to T1{1}				27690	1.00	(17)	DISP	8.86	176.85
Amb to T1{1}				27690	1.00	(17)	DISP	8.86	176.85
Sus. + E1{1}		13287	14384		1.00	(16)	OCC	34.86	141.48
Sus. + E2{1}		13287	14384		1.00	(16)	OCC	34.86	141.48
Sus. + E3{1}		13287	7104		1.00	(16)	OCC	32.53	141.48
Sus. + E4{1}		13287	7104		1.00	(16)	OCC	32.53	141.48
Sus. + W1{1}		13287	6899		1.00	(16)	OCC	32.46	141.48
Sus. + W2{1}		13287	6899		1.00	(16)	OCC	32.46	141.48
Sus. + W3{1}		13287	3256		1.00	(16)	OCC	31.30	141.48
Sus. + W4{1}		13287	3256		1.00	(16)	OCC	31.30	141.48
A14 F-		Max P{1}					( 3)	HOOP	72.95
	GR + Max P{1}	13287			3.27	(15)	SUST	36.43	117.90
	TR:Amb to T1{1}			27690	3.27	(17)	DISP	28.98	176.85
	Amb to T1{1}			27690	3.27	(17)	DISP	28.98	176.85
	Sus. + E1{1}	13287	14384		3.27	(16)	OCC	47.72	141.48
	Sus. + E2{1}	13287	14384		3.27	(16)	OCC	47.72	141.48
	Sus. + E3{1}	13287	7104		3.27	(16)	OCC	42.00	141.48
	Sus. + E4{1}	13287	7104		3.27	(16)	OCC	42.00	141.48
	Sus. + W1{1}	13287	6899		3.27	(16)	OCC	41.84	141.48
	Sus. + W2{1}	13287	6899		3.27	(16)	OCC	41.84	141.48
	Sus. + W3{1}	13287	3256		3.27	(16)	OCC	38.98	141.48
	Sus. + W4{1}	13287	3256		3.27	(16)	OCC	38.98	141.48
	A14 N+	Max P{1}					( 3)	HOOP	72.95
GR + Max P{1}		5298			3.27	(15)	SUST	30.16	117.90
TR:Amb to T1{1}				17046	3.27	(17)	DISP	17.84	176.85
Amb to T1{1}				17046	3.27	(17)	DISP	17.84	176.85
Sus. + E1{1}		5298	10787		3.27	(16)	OCC	38.62	141.48
Sus. + E2{1}		5298	10787		3.27	(16)	OCC	38.62	141.48
Sus. + E3{1}		5298	6007		3.27	(16)	OCC	34.87	141.48
Sus. + E4{1}		5298	6007		3.27	(16)	OCC	34.87	141.48
Sus. + W1{1}		5298	4792		3.27	(16)	OCC	33.92	141.48
Sus. + W2{1}		5298	4792		3.27	(16)	OCC	33.92	141.48
Sus. + W3{1}		5298	2852		3.27	(16)	OCC	32.40	141.48
Sus. + W4{1}		5298	2852		3.27	(16)	OCC	32.40	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Load type		
A14 N-	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	5298			1.00	(15)	SUST	27.70	117.90
	TR:Amb to T1{1}			17046	1.00	(17)	DISP	5.46	176.85
	Amb to T1{1}			17046	1.00	(17)	DISP	5.46	176.85
	Sus. + E1{1}	5298	10787		1.00	(16)	OCC	31.15	141.48
	Sus. + E2{1}	5298	10787		1.00	(16)	OCC	31.15	141.48
	Sus. + E3{1}	5298	6007		1.00	(16)	OCC	29.62	141.48
	Sus. + E4{1}	5298	6007		1.00	(16)	OCC	29.62	141.48
	Sus. + W1{1}	5298	4792		1.00	(16)	OCC	29.23	141.48
	Sus. + W2{1}	5298	4792		1.00	(16)	OCC	29.23	141.48
	Sus. + W3{1}	5298	2852		1.00	(16)	OCC	28.61	141.48

	Sus. + W4{1}	5298	2852		1.00	(16)	OCC	28.61	141.48
A13 F+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	14613			1.00	(15)	SUST	30.68	117.90
	TR:Amb to T1{1}			42744	1.00	(17)	DISP	13.68	176.85
	Amb to T1{1}			42744	1.00	(17)	DISP	13.68	176.85
	Sus. + E1{1}	14613	8422		1.00	(16)	OCC	33.37	141.48
	Sus. + E2{1}	14613	8422		1.00	(16)	OCC	33.37	141.48
	Sus. + E3{1}	14613	3832		1.00	(16)	OCC	31.90	141.48
	Sus. + E4{1}	14613	3832		1.00	(16)	OCC	31.90	141.48
	Sus. + W1{1}	14613	4678		1.00	(16)	OCC	32.17	141.48
	Sus. + W2{1}	14613	4678		1.00	(16)	OCC	32.17	141.48
	Sus. + W3{1}	14613	1656		1.00	(16)	OCC	31.21	141.48
	Sus. + W4{1}	14613	1656		1.00	(16)	OCC	31.21	141.48
A13 F-	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	14613			3.27	(15)	SUST	37.47	117.90
	TR:Amb to T1{1}			42744	3.27	(17)	DISP	44.73	176.85
	Amb to T1{1}			42744	3.27	(17)	DISP	44.73	176.85
	Sus. + E1{1}	14613	8422		3.27	(16)	OCC	44.08	141.48
	Sus. + E2{1}	14613	8422		3.27	(16)	OCC	44.08	141.48
	Sus. + E3{1}	14613	3832		3.27	(16)	OCC	40.48	141.48
	Sus. + E4{1}	14613	3832		3.27	(16)	OCC	40.48	141.48
	Sus. + W1{1}	14613	4678		3.27	(16)	OCC	41.14	141.48
	Sus. + W2{1}	14613	4678		3.27	(16)	OCC	41.14	141.48
	Sus. + W3{1}	14613	1656		3.27	(16)	OCC	38.77	141.48
	Sus. + W4{1}	14613	1656		3.27	(16)	OCC	38.77	141.48
A13 N+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	6941			3.27	(15)	SUST	31.45	117.90
	TR:Amb to T1{1}			53402	3.27	(17)	DISP	55.89	176.85
	Amb to T1{1}			53402	3.27	(17)	DISP	55.89	176.85
	Sus. + E1{1}	6941	10983		3.27	(16)	OCC	40.07	141.48
	Sus. + E2{1}	6941	10983		3.27	(16)	OCC	40.07	141.48
	Sus. + E3{1}	6941	4733		3.27	(16)	OCC	35.16	141.48
	Sus. + E4{1}	6941	4733		3.27	(16)	OCC	35.16	141.48
	Sus. + W1{1}	6941	6212		3.27	(16)	OCC	36.32	141.48
	Sus. + W2{1}	6941	6212		3.27	(16)	OCC	36.32	141.48
	Sus. + W3{1}	6941	2278		3.27	(16)	OCC	33.24	141.48
	Sus. + W4{1}	6941	2278		3.27	(16)	OCC	33.24	141.48

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ASME B31.1 (2014) CODE COMPLIANCE										
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.	
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type			
A13 N-	Max P{1}						( 3)	HOOP	72.95	117.90
	GR + Max P{1}	6941			1.00	(15)	SUST	28.22	117.90	
	TR:Amb to T1{1}			53402	1.00	(17)	DISP	17.09	176.85	
	Amb to T1{1}			53402	1.00	(17)	DISP	17.09	176.85	
	Sus. + E1{1}	6941	10983		1.00	(16)	OCC	31.74	141.48	
	Sus. + E2{1}	6941	10983		1.00	(16)	OCC	31.74	141.48	
	Sus. + E3{1}	6941	4733		1.00	(16)	OCC	29.74	141.48	
	Sus. + E4{1}	6941	4733		1.00	(16)	OCC	29.74	141.48	
	Sus. + W1{1}	6941	6212		1.00	(16)	OCC	30.21	141.48	
	Sus. + W2{1}	6941	6212		1.00	(16)	OCC	30.21	141.48	
	Sus. + W3{1}	6941	2278		1.00	(16)	OCC	28.95	141.48	
	Sus. + W4{1}	6941	2278		1.00	(16)	OCC	28.95	141.48	
A12 +	Max P{1}						( 3)	HOOP	72.95	117.90
	GR + Max P{1}	30743			1.00	(15)	SUST	35.84	117.90	
	TR:Amb to T1{1}			22295	1.00	(17)	DISP	7.14	176.85	
	Amb to T1{1}			22295	1.00	(17)	DISP	7.14	176.85	
	Sus. + E1{1}	30743	7164		1.00	(16)	OCC	38.13	141.48	
	Sus. + E2{1}	30743	7164		1.00	(16)	OCC	38.13	141.48	
	Sus. + E3{1}	30743	8387		1.00	(16)	OCC	38.52	141.48	
	Sus. + E4{1}	30743	8387		1.00	(16)	OCC	38.52	141.48	
	Sus. + W1{1}	30743	4744		1.00	(16)	OCC	37.36	141.48	
	Sus. + W2{1}	30743	4744		1.00	(16)	OCC	37.36	141.48	
	Sus. + W3{1}	30743	2769		1.00	(16)	OCC	36.73	141.48	
	Sus. + W4{1}	30743	2769		1.00	(16)	OCC	36.73	141.48	
A12 -	Max P{1}						( 3)	HOOP	72.95	117.90
	GR + Max P{1}	30743			1.00	(15)	SUST	35.84	117.90	

TR:Amb to T1{1}			22295	1.00	(17)	DISP	7.14	176.85
Amb to T1{1}			22295	1.00	(17)	DISP	7.14	176.85
Sus. + E1{1}	30743	7164		1.00	(16)	OCC	38.13	141.48
Sus. + E2{1}	30743	7164		1.00	(16)	OCC	38.13	141.48
Sus. + E3{1}	30743	8387		1.00	(16)	OCC	38.52	141.48
Sus. + E4{1}	30743	8387		1.00	(16)	OCC	38.52	141.48
Sus. + W1{1}	30743	4744		1.00	(16)	OCC	37.36	141.48
Sus. + W2{1}	30743	4744		1.00	(16)	OCC	37.36	141.48
Sus. + W3{1}	30743	2769		1.00	(16)	OCC	36.73	141.48
Sus. + W4{1}	30743	2769		1.00	(16)	OCC	36.73	141.48
All F+ Max P{1}					( 3)	HOOP	72.95	117.90
GR + Max P{1}	29786			1.00	(15)	SUST	35.53	117.90
TR:Amb to T1{1}			25352	1.00	(17)	DISP	8.11	176.85
Amb to T1{1}			25352	1.00	(17)	DISP	8.11	176.85
Sus. + E1{1}	29786	6943		1.00	(16)	OCC	37.76	141.48
Sus. + E2{1}	29786	6943		1.00	(16)	OCC	37.76	141.48
Sus. + E3{1}	29786	7650		1.00	(16)	OCC	37.98	141.48
Sus. + E4{1}	29786	7650		1.00	(16)	OCC	37.98	141.48
Sus. + W1{1}	29786	4652		1.00	(16)	OCC	37.02	141.48
Sus. + W2{1}	29786	4652		1.00	(16)	OCC	37.02	141.48
Sus. + W3{1}	29786	2608		1.00	(16)	OCC	36.37	141.48
Sus. + W4{1}	29786	2608		1.00	(16)	OCC	36.37	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
		(Moments in N.m )			(Stress in N/mm2 )				
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.	
All F-	Max P{1}					( 3) HOOP	72.95	117.90	
	GR + Max P{1}	29786			3.27	(15) SUST	49.38	117.90	
	TR:Amb to T1{1}			25352	3.27	(17) DISP	26.53	176.85	
	Amb to T1{1}			25352	3.27	(17) DISP	26.53	176.85	
	Sus. + E1{1}	29786	6943		3.27	(16) OCC	54.83	141.48	
	Sus. + E2{1}	29786	6943		3.27	(16) OCC	54.83	141.48	
	Sus. + E3{1}	29786	7650		3.27	(16) OCC	55.38	141.48	
	Sus. + E4{1}	29786	7650		3.27	(16) OCC	55.38	141.48	
	Sus. + W1{1}	29786	4652		3.27	(16) OCC	53.03	141.48	
	Sus. + W2{1}	29786	4652		3.27	(16) OCC	53.03	141.48	
	Sus. + W3{1}	29786	2608		3.27	(16) OCC	51.43	141.48	
	Sus. + W4{1}	29786	2608		3.27	(16) OCC	51.43	141.48	
All N+	Max P{1}					( 3) HOOP	72.95	117.90	
	GR + Max P{1}	21198			3.27	(15) SUST	42.64	117.90	
	TR:Amb to T1{1}			58231	3.27	(17) DISP	60.94	176.85	
	Amb to T1{1}			58231	3.27	(17) DISP	60.94	176.85	
	Sus. + E1{1}	21198	3170		3.27	(16) OCC	45.13	141.48	
	Sus. + E2{1}	21198	3170		3.27	(16) OCC	45.13	141.48	
	Sus. + E3{1}	21198	1654		3.27	(16) OCC	43.94	141.48	
	Sus. + E4{1}	21198	1654		3.27	(16) OCC	43.94	141.48	
	Sus. + W1{1}	21198	2597		3.27	(16) OCC	44.68	141.48	
	Sus. + W2{1}	21198	2597		3.27	(16) OCC	44.68	141.48	
	Sus. + W3{1}	21198	1031		3.27	(16) OCC	43.45	141.48	
	Sus. + W4{1}	21198	1031		3.27	(16) OCC	43.45	141.48	
All N-	Max P{1}					( 3) HOOP	72.95	117.90	
	GR + Max P{1}	21198			1.00	(15) SUST	32.79	117.90	
	TR:Amb to T1{1}			58231	1.00	(17) DISP	18.64	176.85	
	Amb to T1{1}			58231	1.00	(17) DISP	18.64	176.85	
	Sus. + E1{1}	21198	3170		1.00	(16) OCC	33.80	141.48	
	Sus. + E2{1}	21198	3170		1.00	(16) OCC	33.80	141.48	
	Sus. + E3{1}	21198	1654		1.00	(16) OCC	33.31	141.48	
	Sus. + E4{1}	21198	1654		1.00	(16) OCC	33.31	141.48	
	Sus. + W1{1}	21198	2597		1.00	(16) OCC	33.62	141.48	
	Sus. + W2{1}	21198	2597		1.00	(16) OCC	33.62	141.48	
	Sus. + W3{1}	21198	1031		1.00	(16) OCC	33.12	141.48	
	Sus. + W4{1}	21198	1031		1.00	(16) OCC	33.12	141.48	
A09 F+	Max P{1}					( 3) HOOP	72.95	117.90	
	GR + Max P{1}	62605			1.00	(15) SUST	46.04	117.90	
	TR:Amb to T1{1}			87718	1.00	(17) DISP	28.08	176.85	
	Amb to T1{1}			87718	1.00	(17) DISP	28.08	176.85	
	Sus. + E1{1}	62605	1990		1.00	(16) OCC	46.68	141.48	
	Sus. + E2{1}	62605	1990		1.00	(16) OCC	46.68	141.48	

Sus. + E3{1}	62605	2825	1.00	(16)	OCC	46.94	141.48
Sus. + E4{1}	62605	2825	1.00	(16)	OCC	46.94	141.48
Sus. + W1{1}	62605	1734	1.00	(16)	OCC	46.59	141.48
Sus. + W2{1}	62605	1734	1.00	(16)	OCC	46.59	141.48
Sus. + W3{1}	62605	804	1.00	(16)	OCC	46.30	141.48
Sus. + W4{1}	62605	804	1.00	(16)	OCC	46.30	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )					
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A09 N-	Max P{1}				( 3)	HOOP	72.95	117.90
	GR + Max P{1}	35884			1.00	(15) SUST	37.49	117.90
	TR:Amb to T1{1}			109023	1.00	(17) DISP	34.90	176.85
	Amb to T1{1}			109023	1.00	(17) DISP	34.90	176.85
	Sus. + E1{1}	35884	3995		1.00	(16) OCC	38.76	141.48
	Sus. + E2{1}	35884	3995		1.00	(16) OCC	38.76	141.48
	Sus. + E3{1}	35884	2737		1.00	(16) OCC	38.36	141.48
	Sus. + E4{1}	35884	2737		1.00	(16) OCC	38.36	141.48
	Sus. + W1{1}	35884	881		1.00	(16) OCC	37.77	141.48
	Sus. + W2{1}	35884	881		1.00	(16) OCC	37.77	141.48
	Sus. + W3{1}	35884	941		1.00	(16) OCC	37.79	141.48
	Sus. + W4{1}	35884	941		1.00	(16) OCC	37.79	141.48
A07 F+	Max P{1}				( 3)	HOOP	72.95	117.90
	GR + Max P{1}	34954			1.00	(15) SUST	37.19	117.90
	TR:Amb to T1{1}			41721	1.00	(17) DISP	13.35	176.85
	Amb to T1{1}			41721	1.00	(17) DISP	13.35	176.85
	Sus. + E1{1}	34954	3844		1.00	(16) OCC	38.42	141.48
	Sus. + E2{1}	34954	3844		1.00	(16) OCC	38.42	141.48
	Sus. + E3{1}	34954	6629		1.00	(16) OCC	39.31	141.48
	Sus. + E4{1}	34954	6629		1.00	(16) OCC	39.31	141.48
	Sus. + W1{1}	34954	2197		1.00	(16) OCC	37.89	141.48
	Sus. + W2{1}	34954	2197		1.00	(16) OCC	37.89	141.48
	Sus. + W3{1}	34954	1964		1.00	(16) OCC	37.82	141.48
	Sus. + W4{1}	34954	1964		1.00	(16) OCC	37.82	141.48
A07 N-	Max P{1}				( 3)	HOOP	72.95	117.90
	GR + Max P{1}	32771			1.00	(15) SUST	36.49	117.90
	TR:Amb to T1{1}			45405	1.00	(17) DISP	14.53	176.85
	Amb to T1{1}			45405	1.00	(17) DISP	14.53	176.85
	Sus. + E1{1}	32771	3814		1.00	(16) OCC	37.71	141.48
	Sus. + E2{1}	32771	3814		1.00	(16) OCC	37.71	141.48
	Sus. + E3{1}	32771	7434		1.00	(16) OCC	38.87	141.48
	Sus. + E4{1}	32771	7434		1.00	(16) OCC	38.87	141.48
	Sus. + W1{1}	32771	1564		1.00	(16) OCC	36.99	141.48
	Sus. + W2{1}	32771	1564		1.00	(16) OCC	36.99	141.48
	Sus. + W3{1}	32771	2204		1.00	(16) OCC	37.20	141.48
	Sus. + W4{1}	32771	2204		1.00	(16) OCC	37.20	141.48
A06 F+	Max P{1}				( 3)	HOOP	72.95	117.90
	GR + Max P{1}	37442			1.00	(15) SUST	37.98	117.90
	TR:Amb to T1{1}			57292	1.00	(17) DISP	18.34	176.85
	Amb to T1{1}			57292	1.00	(17) DISP	18.34	176.85
	Sus. + E1{1}	37442	12466		1.00	(16) OCC	41.98	141.48
	Sus. + E2{1}	37442	12466		1.00	(16) OCC	41.98	141.48
	Sus. + E3{1}	37442	10567		1.00	(16) OCC	41.37	141.48
	Sus. + E4{1}	37442	10567		1.00	(16) OCC	41.37	141.48
	Sus. + W1{1}	37442	4022		1.00	(16) OCC	39.27	141.48
	Sus. + W2{1}	37442	4022		1.00	(16) OCC	39.27	141.48
	Sus. + W3{1}	37442	3431		1.00	(16) OCC	39.08	141.48
	Sus. + W4{1}	37442	3431		1.00	(16) OCC	39.08	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A06 N-	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	37273			1.00	(15)	SUST	37.93	117.90
	TR:Amb to T1{1}			57518	1.00	(17)	DISP	18.41	176.85
	Amb to T1{1}			57518	1.00	(17)	DISP	18.41	176.85
	Sus. + E1{1}	37273	12481		1.00	(16)	OCC	41.93	141.48
	Sus. + E2{1}	37273	12481		1.00	(16)	OCC	41.93	141.48
	Sus. + E3{1}	37273	10146		1.00	(16)	OCC	41.18	141.48
	Sus. + E4{1}	37273	10146		1.00	(16)	OCC	41.18	141.48
	Sus. + W1{1}	37273	4093		1.00	(16)	OCC	39.24	141.48
	Sus. + W2{1}	37273	4093		1.00	(16)	OCC	39.24	141.48
	Sus. + W3{1}	37273	3312		1.00	(16)	OCC	38.99	141.48
	Sus. + W4{1}	37273	3312		1.00	(16)	OCC	38.99	141.48
A05 F+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	12540			1.00	(15)	SUST	30.01	117.90
	TR:Amb to T1{1}			157727	1.00	(17)	DISP	50.49	176.85
	Amb to T1{1}			157727	1.00	(17)	DISP	50.49	176.85
	Sus. + E1{1}	12540	11108		1.00	(16)	OCC	33.57	141.48
	Sus. + E2{1}	12540	11108		1.00	(16)	OCC	33.57	141.48
	Sus. + E3{1}	12540	2941		1.00	(16)	OCC	30.96	141.48
	Sus. + E4{1}	12540	2941		1.00	(16)	OCC	30.96	141.48
	Sus. + W1{1}	12540	3802		1.00	(16)	OCC	31.23	141.48
	Sus. + W2{1}	12540	3802		1.00	(16)	OCC	31.23	141.48
	Sus. + W3{1}	12540	804		1.00	(16)	OCC	30.27	141.48
	Sus. + W4{1}	12540	804		1.00	(16)	OCC	30.27	141.48
A05 N-	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	9154			1.00	(15)	SUST	28.93	117.90
	TR:Amb to T1{1}			135035	1.00	(17)	DISP	43.22	176.85
	Amb to T1{1}			135035	1.00	(17)	DISP	43.22	176.85
	Sus. + E1{1}	9154	6945		1.00	(16)	OCC	31.15	141.48
	Sus. + E2{1}	9154	6945		1.00	(16)	OCC	31.15	141.48
	Sus. + E3{1}	9154	6499		1.00	(16)	OCC	31.01	141.48
	Sus. + E4{1}	9154	6499		1.00	(16)	OCC	31.01	141.48
	Sus. + W1{1}	9154	2304		1.00	(16)	OCC	29.67	141.48
	Sus. + W2{1}	9154	2304		1.00	(16)	OCC	29.67	141.48
	Sus. + W3{1}	9154	2130		1.00	(16)	OCC	29.61	141.48
	Sus. + W4{1}	9154	2130		1.00	(16)	OCC	29.61	141.48
A04 F+	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	11477			1.00	(15)	SUST	29.67	117.90
	TR:Amb to T1{1}			89990	1.00	(17)	DISP	28.80	176.85
	Amb to T1{1}			89990	1.00	(17)	DISP	28.80	176.85
	Sus. + E1{1}	11477	9232		1.00	(16)	OCC	32.63	141.48
	Sus. + E2{1}	11477	9232		1.00	(16)	OCC	32.63	141.48
	Sus. + E3{1}	11477	6093		1.00	(16)	OCC	31.62	141.48
	Sus. + E4{1}	11477	6093		1.00	(16)	OCC	31.62	141.48
	Sus. + W1{1}	11477	3055		1.00	(16)	OCC	30.65	141.48
	Sus. + W2{1}	11477	3055		1.00	(16)	OCC	30.65	141.48
	Sus. + W3{1}	11477	1582		1.00	(16)	OCC	30.18	141.48
	Sus. + W4{1}	11477	1582		1.00	(16)	OCC	30.18	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A04 N-	Max P{1}					( 3)	HOOP	72.95	117.90
	GR + Max P{1}	27003			1.00	(15)	SUST	34.64	117.90
	TR:Amb to T1{1}			165977	1.00	(17)	DISP	53.13	176.85
	Amb to T1{1}			165977	1.00	(17)	DISP	53.13	176.85
	Sus. + E1{1}	27003	16512		1.00	(16)	OCC	39.93	141.48
	Sus. + E2{1}	27003	16512		1.00	(16)	OCC	39.93	141.48
	Sus. + E3{1}	27003	7311		1.00	(16)	OCC	36.98	141.48
	Sus. + E4{1}	27003	7311		1.00	(16)	OCC	36.98	141.48
	Sus. + W1{1}	27003	5578		1.00	(16)	OCC	36.43	141.48
	Sus. + W2{1}	27003	5578		1.00	(16)	OCC	36.43	141.48
	Sus. + W3{1}	27003	1625		1.00	(16)	OCC	35.16	141.48
	Sus. + W4{1}	27003	1625		1.00	(16)	OCC	35.16	141.48

A02 F+ Max P{1}				( 3)	HOOP	72.95	117.90
GR + Max P{1}	28379			1.00	(15) SUST	35.08	117.90
TR:Amb to T1{1}			211852	1.00	(17) DISP	67.81	176.85
Amb to T1{1}			211852	1.00	(17) DISP	67.81	176.85
Sus. + E1{1}	28379	7303		1.00	(16) OCC	37.42	141.48
Sus. + E2{1}	28379	7303		1.00	(16) OCC	37.42	141.48
Sus. + E3{1}	28379	11884		1.00	(16) OCC	38.89	141.48
Sus. + E4{1}	28379	11884		1.00	(16) OCC	38.89	141.48
Sus. + W1{1}	28379	2257		1.00	(16) OCC	35.81	141.48
Sus. + W2{1}	28379	2257		1.00	(16) OCC	35.81	141.48
Sus. + W3{1}	28379	2852		1.00	(16) OCC	36.00	141.48
Sus. + W4{1}	28379	2852		1.00	(16) OCC	36.00	141.48
-----							
A02 N- Max P{1}				( 3)	HOOP	72.95	117.90
GR + Max P{1}	19651			1.00	(15) SUST	32.29	117.90
TR:Amb to T1{1}			222792	1.00	(17) DISP	71.31	176.85
Amb to T1{1}			222792	1.00	(17) DISP	71.31	176.85
Sus. + E1{1}	19651	9179		1.00	(16) OCC	35.23	141.48
Sus. + E2{1}	19651	9179		1.00	(16) OCC	35.23	141.48
Sus. + E3{1}	19651	11362		1.00	(16) OCC	35.93	141.48
Sus. + E4{1}	19651	11362		1.00	(16) OCC	35.93	141.48
Sus. + W1{1}	19651	2512		1.00	(16) OCC	33.09	141.48
Sus. + W2{1}	19651	2512		1.00	(16) OCC	33.09	141.48
Sus. + W3{1}	19651	2679		1.00	(16) OCC	33.15	141.48
Sus. + W4{1}	19651	2679		1.00	(16) OCC	33.15	141.48

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R E S U L T S U M M A R Y

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Maximum sustained stress ratio

Point : A06 F  
Stress N/mm2 : 86.26  
Allowable N/mm2 : 117.90  
Ratio : 0.73  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A04 N  
Stress N/mm2 : 173.69  
Allowable N/mm2 : 176.85  
Ratio : 0.98  
Load combination : Max Range

Maximum occasional stress ratio

Point : A06 F  
Stress N/mm2 : 106.33  
Allowable N/mm2 : 141.48  
Ratio : 0.75  
Load combination : Sus. + E1{1}

Maximum hoop stress ratio

Point : A02 N  
Stress N/mm2 : 72.95  
Allowable N/mm2 : 117.90  
Ratio : 0.62  
Load combination : Max P{1}



## **LAMPIRAN C**

*GENERAL PIPE STRESS REPORT (HYDROTEST CONDITION WITH  
EXPANSION JOINT, PIPE THICKNESS = 8,808 mm)*

Hydrotest Condition with Expansion  
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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A07 F-	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	47184			6.81	(15) SUST	111.31	117.90
	TR:Amb to T1{1}			16194	6.81	(17) DISP	38.07	176.85
	Amb to T1{1}			16194	6.81	(17) DISP	38.07	176.85
	Sus. + E1{1}	47184	4105		6.81	(16) OCC	118.55	141.48
	Sus. + E2{1}	47184	4105		6.81	(16) OCC	118.55	141.48
	Sus. + E3{1}	47184	10056		6.81	(16) OCC	129.04	141.48
	Sus. + E4{1}	47184	10056		6.81	(16) OCC	129.04	141.48
	Sus. + W1{1}	47184	2350		6.81	(16) OCC	115.46	141.48
	Sus. + W2{1}	47184	2350		6.81	(16) OCC	115.46	141.48
	Sus. + W3{1}	47184	2549		6.81	(16) OCC	115.81	141.48
	Sus. + W4{1}	47184	2549		6.81	(16) OCC	115.81	141.48
A07 N+	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	45249			6.81	(15) SUST	107.90	117.90
	TR:Amb to T1{1}			13189	6.81	(17) DISP	31.01	176.85
	Amb to T1{1}			13189	6.81	(17) DISP	31.01	176.85
	Sus. + E1{1}	45249	5011		6.81	(16) OCC	116.74	141.48
	Sus. + E2{1}	45249	5011		6.81	(16) OCC	116.74	141.48
	Sus. + E3{1}	45249	10455		6.81	(16) OCC	126.33	141.48
	Sus. + E4{1}	45249	10455		6.81	(16) OCC	126.33	141.48
	Sus. + W1{1}	45249	1667		6.81	(16) OCC	110.84	141.48
	Sus. + W2{1}	45249	1667		6.81	(16) OCC	110.84	141.48
	Sus. + W3{1}	45249	2722		6.81	(16) OCC	112.70	141.48
	Sus. + W4{1}	45249	2722		6.81	(16) OCC	112.70	141.48
A06 N+	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	36770			6.81	(15) SUST	92.95	117.90
	TR:Amb to T1{1}			53162	6.81	(17) DISP	124.98	176.85
	Amb to T1{1}			53162	6.81	(17) DISP	124.98	176.85
	Sus. + E1{1}	36770	14488		6.81	(16) OCC	118.49	141.48
	Sus. + E2{1}	36770	14488		6.81	(16) OCC	118.49	141.48
	Sus. + E3{1}	36770	11233		6.81	(16) OCC	112.76	141.48
	Sus. + E4{1}	36770	11233		6.81	(16) OCC	112.76	141.48
	Sus. + W1{1}	36770	4291		6.81	(16) OCC	100.51	141.48
	Sus. + W2{1}	36770	4291		6.81	(16) OCC	100.51	141.48
	Sus. + W3{1}	36770	3298		6.81	(16) OCC	98.76	141.48
	Sus. + W4{1}	36770	3298		6.81	(16) OCC	98.76	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A06 F-	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	36948			6.81	(15) SUST	93.26	117.90
	TR:Amb to T1{1}			50446	6.81	(17) DISP	118.60	176.85
	Amb to T1{1}			50446	6.81	(17) DISP	118.60	176.85
	Sus. + E1{1}	36948	14119		6.81	(16) OCC	118.16	141.48
	Sus. + E2{1}	36948	14119		6.81	(16) OCC	118.16	141.48
	Sus. + E3{1}	36948	11445		6.81	(16) OCC	113.44	141.48
	Sus. + E4{1}	36948	11445		6.81	(16) OCC	113.44	141.48
	Sus. + W1{1}	36948	4137		6.81	(16) OCC	100.56	141.48
	Sus. + W2{1}	36948	4137		6.81	(16) OCC	100.56	141.48
	Sus. + W3{1}	36948	3375		6.81	(16) OCC	99.21	141.48
	Sus. + W4{1}	36948	3375		6.81	(16) OCC	99.21	141.48
A05 N+	Max P{1}					( 3) HOOP	80.50	117.90

GR + Max P{1}	22006		3.25	(15)	SUST	46.64	117.90
TR:Amb to T1{1}			102202				
Amb to T1{1}			102202			114.73	176.85
Sus. + E1{1}	22006	14024	3.25	(16)	OCC	58.45	141.48
Sus. + E2{1}	22006	14024	3.25	(16)	OCC	58.45	141.48
Sus. + E3{1}	22006	9282	3.25	(16)	OCC	54.46	141.48
Sus. + E4{1}	22006	9282	3.25	(16)	OCC	54.46	141.48
Sus. + W1{1}	22006	3689	3.25	(16)	OCC	49.75	141.48
Sus. + W2{1}	22006	3689	3.25	(16)	OCC	49.75	141.48
Sus. + W3{1}	22006	2385	3.25	(16)	OCC	48.65	141.48
Sus. + W4{1}	22006	2385	3.25	(16)	OCC	48.65	141.48
A05 F- Max P{1}							
GR + Max P{1}	21543			( 3)	HOOP	80.50	117.90
TR:Amb to T1{1}			98110			46.25	117.90
Amb to T1{1}			98110			110.14	176.85
Sus. + E1{1}	21543	17357	3.25	(16)	OCC	60.87	141.48
Sus. + E2{1}	21543	17357	3.25	(16)	OCC	60.87	141.48
Sus. + E3{1}	21543	7700	3.25	(16)	OCC	52.74	141.48
Sus. + E4{1}	21543	7700	3.25	(16)	OCC	52.74	141.48
Sus. + W1{1}	21543	4932	3.25	(16)	OCC	50.41	141.48
Sus. + W2{1}	21543	4932	3.25	(16)	OCC	50.41	141.48
Sus. + W3{1}	21543	1603	3.25	(16)	OCC	47.60	141.48
Sus. + W4{1}	21543	1603	3.25	(16)	OCC	47.60	141.48
A04 F- Max P{1}							
GR + Max P{1}	20234			( 3)	HOOP	80.50	117.90
TR:Amb to T1{1}			84008			45.15	117.90
Amb to T1{1}			84008			94.31	176.85
Sus. + E1{1}	20234	11508	3.25	(16)	OCC	54.84	141.48
Sus. + E2{1}	20234	11508	3.25	(16)	OCC	54.84	141.48
Sus. + E3{1}	20234	11787	3.25	(16)	OCC	55.08	141.48
Sus. + E4{1}	20234	11787	3.25	(16)	OCC	55.08	141.48
Sus. + W1{1}	20234	3061	3.25	(16)	OCC	47.73	141.48
Sus. + W2{1}	20234	3061	3.25	(16)	OCC	47.73	141.48
Sus. + W3{1}	20234	2836	3.25	(16)	OCC	47.54	141.48
Sus. + W4{1}	20234	2836	3.25	(16)	OCC	47.54	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A10 +	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	182352			1.00	(15)	SUST	91.03	117.90
	TR:Amb to T1{1}			55274	1.00	(17)	DISP	19.07	176.85
	Amb to T1{1}			55274	1.00	(17)	DISP	19.07	176.85
	Sus. + E1{1}	182352	5631		1.00	(16)	OCC	92.97	141.48
	Sus. + E2{1}	182352	5631		1.00	(16)	OCC	92.97	141.48
	Sus. + E3{1}	182352	4612		1.00	(16)	OCC	92.62	141.48
	Sus. + E4{1}	182352	4612		1.00	(16)	OCC	92.62	141.48
	Sus. + W1{1}	182352	1766		1.00	(16)	OCC	91.64	141.48
	Sus. + W2{1}	182352	1766		1.00	(16)	OCC	91.64	141.48
	Sus. + W3{1}	182352	1133		1.00	(16)	OCC	91.42	141.48
	Sus. + W4{1}	182352	1133		1.00	(16)	OCC	91.42	141.48
A10 -	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	182352			1.00	(15)	SUST	91.03	117.90
	TR:Amb to T1{1}			55274	1.00	(17)	DISP	19.07	176.85
	Amb to T1{1}			55274	1.00	(17)	DISP	19.07	176.85
	Sus. + E1{1}	182352	5631		1.00	(16)	OCC	92.97	141.48
	Sus. + E2{1}	182352	5631		1.00	(16)	OCC	92.97	141.48
	Sus. + E3{1}	182352	4612		1.00	(16)	OCC	92.62	141.48
	Sus. + E4{1}	182352	4612		1.00	(16)	OCC	92.62	141.48
	Sus. + W1{1}	182352	1766		1.00	(16)	OCC	91.64	141.48
	Sus. + W2{1}	182352	1766		1.00	(16)	OCC	91.64	141.48
	Sus. + W3{1}	182352	1133		1.00	(16)	OCC	91.42	141.48
	Sus. + W4{1}	182352	1133		1.00	(16)	OCC	91.42	141.48
A09 F-	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	67573			3.25	(15)	SUST	85.01	117.90
	TR:Amb to T1{1}			80023	3.25	(17)	DISP	89.83	176.85
	Amb to T1{1}			80023	3.25	(17)	DISP	89.83	176.85
	Sus. + E1{1}	67573	4760		3.25	(16)	OCC	89.02	141.48

Sus. + E2{1}	67573	4760	3.25	(16)	OCC	89.02	141.48
Sus. + E3{1}	67573	6114	3.25	(16)	OCC	90.16	141.48
Sus. + E4{1}	67573	6114	3.25	(16)	OCC	90.16	141.48
Sus. + W1{1}	67573	1967	3.25	(16)	OCC	86.66	141.48
Sus. + W2{1}	67573	1967	3.25	(16)	OCC	86.66	141.48
Sus. + W3{1}	67573	1423	3.25	(16)	OCC	86.21	141.48
Sus. + W4{1}	67573	1423	3.25	(16)	OCC	86.21	141.48

A09 N+ Max P{1}				( 3)	HOOP	80.50	117.90	
GR + Max P{1}	37219		3.25	(15)	SUST	59.45	117.90	
TR:Amb to T1{1}			77597	3.25	(17)	DISP	87.11	176.85
Amb to T1{1}			77597	3.25	(17)	DISP	87.11	176.85
Sus. + E1{1}	37219	6200	3.25	(16)	OCC	64.67	141.48	
Sus. + E2{1}	37219	6200	3.25	(16)	OCC	64.67	141.48	
Sus. + E3{1}	37219	7005	3.25	(16)	OCC	65.35	141.48	
Sus. + E4{1}	37219	7005	3.25	(16)	OCC	65.35	141.48	
Sus. + W1{1}	37219	1613	3.25	(16)	OCC	60.81	141.48	
Sus. + W2{1}	37219	1613	3.25	(16)	OCC	60.81	141.48	
Sus. + W3{1}	37219	1809	3.25	(16)	OCC	60.98	141.48	
Sus. + W4{1}	37219	1809	3.25	(16)	OCC	60.98	141.48	

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type		
A15 Max P{1}						( 3) HOOP	80.50	117.90
GR + Max P{1}		9363			1.00	(15) SUST	31.35	117.90
TR:Amb to T1{1}				25243	1.00	(17) DISP	8.71	176.85
Amb to T1{1}				25243	1.00	(17) DISP	8.71	176.85
Sus. + E1{1}		9363	32358		1.00	(16) OCC	42.51	141.48
Sus. + E2{1}		9363	32358		1.00	(16) OCC	42.51	141.48
Sus. + E3{1}		9363	33568		1.00	(16) OCC	42.93	141.48
Sus. + E4{1}		9363	33568		1.00	(16) OCC	42.93	141.48
Sus. + W1{1}		9363	18721		1.00	(16) OCC	37.81	141.48
Sus. + W2{1}		9363	18721		1.00	(16) OCC	37.81	141.48
Sus. + W3{1}		9363	14969		1.00	(16) OCC	36.51	141.48
Sus. + W4{1}		9363	14969		1.00	(16) OCC	36.51	141.48
A14 F+ Max P{1}						( 3) HOOP	80.50	117.90
GR + Max P{1}		15117			1.00	(15) SUST	33.33	117.90
TR:Amb to T1{1}				40877	1.00	(17) DISP	14.10	176.85
Amb to T1{1}				40877	1.00	(17) DISP	14.10	176.85
Sus. + E1{1}		15117	16699		1.00	(16) OCC	39.09	141.48
Sus. + E2{1}		15117	16699		1.00	(16) OCC	39.09	141.48
Sus. + E3{1}		15117	7958		1.00	(16) OCC	36.08	141.48
Sus. + E4{1}		15117	7958		1.00	(16) OCC	36.08	141.48
Sus. + W1{1}		15117	8147		1.00	(16) OCC	36.14	141.48
Sus. + W2{1}		15117	8147		1.00	(16) OCC	36.14	141.48
Sus. + W3{1}		15117	3863		1.00	(16) OCC	34.66	141.48
Sus. + W4{1}		15117	3863		1.00	(16) OCC	34.66	141.48
A14 F- Max P{1}						( 3) HOOP	80.50	117.90
GR + Max P{1}		15117			3.25	(15) SUST	40.84	117.90
TR:Amb to T1{1}				40877	3.25	(17) DISP	45.89	176.85
Amb to T1{1}				40877	3.25	(17) DISP	45.89	176.85
Sus. + E1{1}		15117	16699		3.25	(16) OCC	54.90	141.48
Sus. + E2{1}		15117	16699		3.25	(16) OCC	54.90	141.48
Sus. + E3{1}		15117	7958		3.25	(16) OCC	47.54	141.48
Sus. + E4{1}		15117	7958		3.25	(16) OCC	47.54	141.48
Sus. + W1{1}		15117	8147		3.25	(16) OCC	47.70	141.48
Sus. + W2{1}		15117	8147		3.25	(16) OCC	47.70	141.48
Sus. + W3{1}		15117	3863		3.25	(16) OCC	44.10	141.48
Sus. + W4{1}		15117	3863		3.25	(16) OCC	44.10	141.48
A14 N+ Max P{1}						( 3) HOOP	80.50	117.90
GR + Max P{1}		5686			3.25	(15) SUST	32.90	117.90
TR:Amb to T1{1}				26120	3.25	(17) DISP	29.32	176.85
Amb to T1{1}				26120	3.25	(17) DISP	29.32	176.85
Sus. + E1{1}		5686	13105		3.25	(16) OCC	43.94	141.48
Sus. + E2{1}		5686	13105		3.25	(16) OCC	43.94	141.48
Sus. + E3{1}		5686	6302		3.25	(16) OCC	38.21	141.48
Sus. + E4{1}		5686	6302		3.25	(16) OCC	38.21	141.48
Sus. + W1{1}		5686	5752		3.25	(16) OCC	37.75	141.48

Sus. + W2{1}	5686	5752	3.25	(16)	OCC	37.75	141.48
Sus. + W3{1}	5686	3208	3.25	(16)	OCC	35.60	141.48
Sus. + W4{1}	5686	3208	3.25	(16)	OCC	35.60	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )	Ma (Sus.)	Mb (Occ.)			
A14 N-	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	5686			1.00	(15) SUST	30.08	117.90
	TR:Amb to T1{1}			26120	1.00	(17) DISP	9.01	176.85
	Amb to T1{1}			26120	1.00	(17) DISP	9.01	176.85
	Sus. + E1{1}	5686	13105		1.00	(16) OCC	34.60	141.48
	Sus. + E2{1}	5686	13105		1.00	(16) OCC	34.60	141.48
	Sus. + E3{1}	5686	6302		1.00	(16) OCC	32.25	141.48
	Sus. + E4{1}	5686	6302		1.00	(16) OCC	32.25	141.48
	Sus. + W1{1}	5686	5752		1.00	(16) OCC	32.06	141.48
	Sus. + W2{1}	5686	5752		1.00	(16) OCC	32.06	141.48
	Sus. + W3{1}	5686	3208		1.00	(16) OCC	31.18	141.48
	Sus. + W4{1}	5686	3208		1.00	(16) OCC	31.18	141.48
A13 F+	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	15753			1.00	(15) SUST	33.55	117.90
	TR:Amb to T1{1}			49768	1.00	(17) DISP	17.17	176.85
	Amb to T1{1}			49768	1.00	(17) DISP	17.17	176.85
	Sus. + E1{1}	15753	8419		1.00	(16) OCC	36.46	141.48
	Sus. + E2{1}	15753	8419		1.00	(16) OCC	36.46	141.48
	Sus. + E3{1}	15753	3846		1.00	(16) OCC	34.88	141.48
	Sus. + E4{1}	15753	3846		1.00	(16) OCC	34.88	141.48
	Sus. + W1{1}	15753	4719		1.00	(16) OCC	35.18	141.48
	Sus. + W2{1}	15753	4719		1.00	(16) OCC	35.18	141.48
	Sus. + W3{1}	15753	1777		1.00	(16) OCC	34.16	141.48
	Sus. + W4{1}	15753	1777		1.00	(16) OCC	34.16	141.48
A13 F-	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	15753			3.25	(15) SUST	41.38	117.90
	TR:Amb to T1{1}			49768	3.25	(17) DISP	55.87	176.85
	Amb to T1{1}			49768	3.25	(17) DISP	55.87	176.85
	Sus. + E1{1}	15753	8419		3.25	(16) OCC	48.47	141.48
	Sus. + E2{1}	15753	8419		3.25	(16) OCC	48.47	141.48
	Sus. + E3{1}	15753	3846		3.25	(16) OCC	44.62	141.48
	Sus. + E4{1}	15753	3846		3.25	(16) OCC	44.62	141.48
	Sus. + W1{1}	15753	4719		3.25	(16) OCC	45.35	141.48
	Sus. + W2{1}	15753	4719		3.25	(16) OCC	45.35	141.48
	Sus. + W3{1}	15753	1777		3.25	(16) OCC	42.88	141.48
	Sus. + W4{1}	15753	1777		3.25	(16) OCC	42.88	141.48
A13 N+	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	9355			3.25	(15) SUST	35.99	117.90
	TR:Amb to T1{1}			64711	3.25	(17) DISP	72.64	176.85
	Amb to T1{1}			64711	3.25	(17) DISP	72.64	176.85
	Sus. + E1{1}	9355	10722		3.25	(16) OCC	45.02	141.48
	Sus. + E2{1}	9355	10722		3.25	(16) OCC	45.02	141.48
	Sus. + E3{1}	9355	5152		3.25	(16) OCC	40.33	141.48
	Sus. + E4{1}	9355	5152		3.25	(16) OCC	40.33	141.48
	Sus. + W1{1}	9355	6571		3.25	(16) OCC	41.52	141.48
	Sus. + W2{1}	9355	6571		3.25	(16) OCC	41.52	141.48
	Sus. + W3{1}	9355	2628		3.25	(16) OCC	38.21	141.48
	Sus. + W4{1}	9355	2628		3.25	(16) OCC	38.21	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )	Ma (Sus.)	Mb (Occ.)			

name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no.	type	Stress	Allow.
A13 N-	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	9355			1.00	(15)	SUST	31.34	117.90
	TR:Amb to T1{1}			64711	1.00	(17)	DISP	22.33	176.85
	Amb to T1{1}			64711	1.00	(17)	DISP	22.33	176.85
	Sus. + E1{1}	9355	10722		1.00	(16)	OCC	35.04	141.48
	Sus. + E2{1}	9355	10722		1.00	(16)	OCC	35.04	141.48
	Sus. + E3{1}	9355	5152		1.00	(16)	OCC	33.12	141.48
	Sus. + E4{1}	9355	5152		1.00	(16)	OCC	33.12	141.48
	Sus. + W1{1}	9355	6571		1.00	(16)	OCC	33.61	141.48
	Sus. + W2{1}	9355	6571		1.00	(16)	OCC	33.61	141.48
	Sus. + W3{1}	9355	2628		1.00	(16)	OCC	32.25	141.48
	Sus. + W4{1}	9355	2628		1.00	(16)	OCC	32.25	141.48
A12 +	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	33384			1.00	(15)	SUST	39.63	117.90
	TR:Amb to T1{1}			35692	1.00	(17)	DISP	12.31	176.85
	Amb to T1{1}			35692	1.00	(17)	DISP	12.31	176.85
	Sus. + E1{1}	33384	8193		1.00	(16)	OCC	42.46	141.48
	Sus. + E2{1}	33384	8193		1.00	(16)	OCC	42.46	141.48
	Sus. + E3{1}	33384	9082		1.00	(16)	OCC	42.77	141.48
	Sus. + E4{1}	33384	9082		1.00	(16)	OCC	42.77	141.48
	Sus. + W1{1}	33384	5000		1.00	(16)	OCC	41.36	141.48
	Sus. + W2{1}	33384	5000		1.00	(16)	OCC	41.36	141.48
	Sus. + W3{1}	33384	3203		1.00	(16)	OCC	40.74	141.48
	Sus. + W4{1}	33384	3203		1.00	(16)	OCC	40.74	141.48
A12 -	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	33384			1.00	(15)	SUST	39.63	117.90
	TR:Amb to T1{1}			35692	1.00	(17)	DISP	12.31	176.85
	Amb to T1{1}			35692	1.00	(17)	DISP	12.31	176.85
	Sus. + E1{1}	33384	8193		1.00	(16)	OCC	42.46	141.48
	Sus. + E2{1}	33384	8193		1.00	(16)	OCC	42.46	141.48
	Sus. + E3{1}	33384	9082		1.00	(16)	OCC	42.77	141.48
	Sus. + E4{1}	33384	9082		1.00	(16)	OCC	42.77	141.48
	Sus. + W1{1}	33384	5000		1.00	(16)	OCC	41.36	141.48
	Sus. + W2{1}	33384	5000		1.00	(16)	OCC	41.36	141.48
	Sus. + W3{1}	33384	3203		1.00	(16)	OCC	40.74	141.48
	Sus. + W4{1}	33384	3203		1.00	(16)	OCC	40.74	141.48
A11 F+	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	32490			1.00	(15)	SUST	39.33	117.90
	TR:Amb to T1{1}			37214	1.00	(17)	DISP	12.84	176.85
	Amb to T1{1}			37214	1.00	(17)	DISP	12.84	176.85
	Sus. + E1{1}	32490	7693		1.00	(16)	OCC	41.98	141.48
	Sus. + E2{1}	32490	7693		1.00	(16)	OCC	41.98	141.48
	Sus. + E3{1}	32490	8429		1.00	(16)	OCC	42.23	141.48
	Sus. + E4{1}	32490	8429		1.00	(16)	OCC	42.23	141.48
	Sus. + W1{1}	32490	4848		1.00	(16)	OCC	41.00	141.48
	Sus. + W2{1}	32490	4848		1.00	(16)	OCC	41.00	141.48
	Sus. + W3{1}	32490	3049		1.00	(16)	OCC	40.38	141.48
	Sus. + W4{1}	32490	3049		1.00	(16)	OCC	40.38	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. no.	Load type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )						
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)					
A11 F-	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	32490			3.25	(15)	SUST	55.47	117.90
	TR:Amb to T1{1}			37214	3.25	(17)	DISP	41.78	176.85
	Amb to T1{1}			37214	3.25	(17)	DISP	41.78	176.85
	Sus. + E1{1}	32490	7693		3.25	(16)	OCC	61.95	141.48
	Sus. + E2{1}	32490	7693		3.25	(16)	OCC	61.95	141.48
	Sus. + E3{1}	32490	8429		3.25	(16)	OCC	62.57	141.48
	Sus. + E4{1}	32490	8429		3.25	(16)	OCC	62.57	141.48
	Sus. + W1{1}	32490	4848		3.25	(16)	OCC	59.55	141.48
	Sus. + W2{1}	32490	4848		3.25	(16)	OCC	59.55	141.48
	Sus. + W3{1}	32490	3049		3.25	(16)	OCC	58.04	141.48
	Sus. + W4{1}	32490	3049		3.25	(16)	OCC	58.04	141.48
A11 N+	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	21554			3.25	(15)	SUST	46.26	117.90

TR:Amb to T1{1}			41313	3.25	(17)	DISP	46.38	176.85
Amb to T1{1}			41313	3.25	(17)	DISP	46.38	176.85
Sus. + E1{1}	21554	2952		3.25	(16)	OCC	48.75	141.48
Sus. + E2{1}	21554	2952		3.25	(16)	OCC	48.75	141.48
Sus. + E3{1}	21554	2677		3.25	(16)	OCC	48.52	141.48
Sus. + E4{1}	21554	2677		3.25	(16)	OCC	48.52	141.48
Sus. + W1{1}	21554	2116		3.25	(16)	OCC	48.05	141.48
Sus. + W2{1}	21554	2116		3.25	(16)	OCC	48.05	141.48
Sus. + W3{1}	21554	1422		3.25	(16)	OCC	47.46	141.48
Sus. + W4{1}	21554	1422		3.25	(16)	OCC	47.46	141.48
All N- Max P{1}					( 3)	HOOP	80.50	117.90
GR + Max P{1}	21554			1.00	(15)	SUST	35.55	117.90
TR:Amb to T1{1}			41313	1.00	(17)	DISP	14.25	176.85
Amb to T1{1}			41313	1.00	(17)	DISP	14.25	176.85
Sus. + E1{1}	21554	2952		1.00	(16)	OCC	36.57	141.48
Sus. + E2{1}	21554	2952		1.00	(16)	OCC	36.57	141.48
Sus. + E3{1}	21554	2677		1.00	(16)	OCC	36.48	141.48
Sus. + E4{1}	21554	2677		1.00	(16)	OCC	36.48	141.48
Sus. + W1{1}	21554	2116		1.00	(16)	OCC	36.28	141.48
Sus. + W2{1}	21554	2116		1.00	(16)	OCC	36.28	141.48
Sus. + W3{1}	21554	1422		1.00	(16)	OCC	36.04	141.48
Sus. + W4{1}	21554	1422		1.00	(16)	OCC	36.04	141.48
A09 F+ Max P{1}					( 3)	HOOP	80.50	117.90
GR + Max P{1}	67573			1.00	(15)	SUST	51.43	117.90
TR:Amb to T1{1}			80023	1.00	(17)	DISP	27.61	176.85
Amb to T1{1}			80023	1.00	(17)	DISP	27.61	176.85
Sus. + E1{1}	67573	4760		1.00	(16)	OCC	53.07	141.48
Sus. + E2{1}	67573	4760		1.00	(16)	OCC	53.07	141.48
Sus. + E3{1}	67573	6114		1.00	(16)	OCC	53.54	141.48
Sus. + E4{1}	67573	6114		1.00	(16)	OCC	53.54	141.48
Sus. + W1{1}	67573	1967		1.00	(16)	OCC	52.11	141.48
Sus. + W2{1}	67573	1967		1.00	(16)	OCC	52.11	141.48
Sus. + W3{1}	67573	1423		1.00	(16)	OCC	51.92	141.48
Sus. + W4{1}	67573	1423		1.00	(16)	OCC	51.92	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Moments in N.m )		(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type			
A09 N- Max P{1}							( 3)	HOOP	80.50	117.90
GR + Max P{1}		37219			1.00	(15)	SUST	40.96	117.90	
TR:Amb to T1{1}				77597	1.00	(17)	DISP	26.77	176.85	
Amb to T1{1}				77597	1.00	(17)	DISP	26.77	176.85	
Sus. + E1{1}		37219	6200		1.00	(16)	OCC	43.10	141.48	
Sus. + E2{1}		37219	6200		1.00	(16)	OCC	43.10	141.48	
Sus. + E3{1}		37219	7005		1.00	(16)	OCC	43.37	141.48	
Sus. + E4{1}		37219	7005		1.00	(16)	OCC	43.37	141.48	
Sus. + W1{1}		37219	1613		1.00	(16)	OCC	41.51	141.48	
Sus. + W2{1}		37219	1613		1.00	(16)	OCC	41.51	141.48	
Sus. + W3{1}		37219	1809		1.00	(16)	OCC	41.58	141.48	
Sus. + W4{1}		37219	1809		1.00	(16)	OCC	41.58	141.48	
A08 + Max P{1}							( 3)	HOOP	80.50	117.90
GR + Max P{1}		30586			1.00	(15)	SUST	38.67	117.90	
TR:Amb to T1{1}				160532	1.00	(17)	DISP	55.39	176.85	
Amb to T1{1}				160532	1.00	(17)	DISP	55.39	176.85	
Sus. + E1{1}		30586	57631		1.00	(16)	OCC	58.55	141.48	
Sus. + E2{1}		30586	57631		1.00	(16)	OCC	58.55	141.48	
Sus. + E3{1}		30586	41351		1.00	(16)	OCC	52.94	141.48	
Sus. + E4{1}		30586	41351		1.00	(16)	OCC	52.94	141.48	
Sus. + W1{1}		30586	24886		1.00	(16)	OCC	47.25	141.48	
Sus. + W2{1}		30586	24886		1.00	(16)	OCC	47.25	141.48	
Sus. + W3{1}		30586	13153		1.00	(16)	OCC	43.21	141.48	
Sus. + W4{1}		30586	13153		1.00	(16)	OCC	43.21	141.48	
A08 - Max P{1}							( 3)	HOOP	80.50	117.90
GR + Max P{1}		30586			1.00	(15)	SUST	38.67	117.90	
TR:Amb to T1{1}				160532	1.00	(17)	DISP	55.39	176.85	
Amb to T1{1}				160532	1.00	(17)	DISP	55.39	176.85	
Sus. + E1{1}		30586	57631		1.00	(16)	OCC	58.55	141.48	
Sus. + E2{1}		30586	57631		1.00	(16)	OCC	58.55	141.48	

Sus. + E3{1}	30586	41351	1.00	(16)	OCC	52.94	141.48
Sus. + E4{1}	30586	41351	1.00	(16)	OCC	52.94	141.48
Sus. + W1{1}	30586	24886	1.00	(16)	OCC	47.25	141.48
Sus. + W2{1}	30586	24886	1.00	(16)	OCC	47.25	141.48
Sus. + W3{1}	30586	13153	1.00	(16)	OCC	43.21	141.48
Sus. + W4{1}	30586	13153	1.00	(16)	OCC	43.21	141.48

A07 F+ Max P{1}				( 3)	HOOP	80.50	117.90
GR + Max P{1}	47184		1.00	(15)	SUST	44.40	117.90
TR:Amb to T1{1}			16194	1.00	(17)	DISP	5.59 176.85
Amb to T1{1}			16194	1.00	(17)	DISP	5.59 176.85
Sus. + E1{1}	47184	4105	1.00	(16)	OCC	45.81	141.48
Sus. + E2{1}	47184	4105	1.00	(16)	OCC	45.81	141.48
Sus. + E3{1}	47184	10056	1.00	(16)	OCC	47.87	141.48
Sus. + E4{1}	47184	10056	1.00	(16)	OCC	47.87	141.48
Sus. + W1{1}	47184	2350	1.00	(16)	OCC	45.21	141.48
Sus. + W2{1}	47184	2350	1.00	(16)	OCC	45.21	141.48
Sus. + W3{1}	47184	2549	1.00	(16)	OCC	45.28	141.48
Sus. + W4{1}	47184	2549	1.00	(16)	OCC	45.28	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F			
A07 N- Max P{1}						( 3) HOOP	80.50	117.90
GR + Max P{1}		45249			1.00	(15) SUST	43.73	117.90
TR:Amb to T1{1}				13189	1.00	(17) DISP	4.55	176.85
Amb to T1{1}				13189	1.00	(17) DISP	4.55	176.85
Sus. + E1{1}		45249	5011		1.00	(16) OCC	45.46	141.48
Sus. + E2{1}		45249	5011		1.00	(16) OCC	45.46	141.48
Sus. + E3{1}		45249	10455		1.00	(16) OCC	47.33	141.48
Sus. + E4{1}		45249	10455		1.00	(16) OCC	47.33	141.48
Sus. + W1{1}		45249	1667		1.00	(16) OCC	44.30	141.48
Sus. + W2{1}		45249	1667		1.00	(16) OCC	44.30	141.48
Sus. + W3{1}		45249	2722		1.00	(16) OCC	44.67	141.48
Sus. + W4{1}		45249	2722		1.00	(16) OCC	44.67	141.48
A06 F+ Max P{1}						( 3) HOOP	80.50	117.90
GR + Max P{1}		36948			1.00	(15) SUST	40.86	117.90
TR:Amb to T1{1}				50446	1.00	(17) DISP	17.40	176.85
Amb to T1{1}				50446	1.00	(17) DISP	17.40	176.85
Sus. + E1{1}		36948	14119		1.00	(16) OCC	45.74	141.48
Sus. + E2{1}		36948	14119		1.00	(16) OCC	45.74	141.48
Sus. + E3{1}		36948	11445		1.00	(16) OCC	44.81	141.48
Sus. + E4{1}		36948	11445		1.00	(16) OCC	44.81	141.48
Sus. + W1{1}		36948	4137		1.00	(16) OCC	42.29	141.48
Sus. + W2{1}		36948	4137		1.00	(16) OCC	42.29	141.48
Sus. + W3{1}		36948	3375		1.00	(16) OCC	42.03	141.48
Sus. + W4{1}		36948	3375		1.00	(16) OCC	42.03	141.48
A06 N- Max P{1}						( 3) HOOP	80.50	117.90
GR + Max P{1}		36770			1.00	(15) SUST	40.80	117.90
TR:Amb to T1{1}				53162	1.00	(17) DISP	18.34	176.85
Amb to T1{1}				53162	1.00	(17) DISP	18.34	176.85
Sus. + E1{1}		36770	14488		1.00	(16) OCC	45.80	141.48
Sus. + E2{1}		36770	14488		1.00	(16) OCC	45.80	141.48
Sus. + E3{1}		36770	11233		1.00	(16) OCC	44.68	141.48
Sus. + E4{1}		36770	11233		1.00	(16) OCC	44.68	141.48
Sus. + W1{1}		36770	4291		1.00	(16) OCC	42.28	141.48
Sus. + W2{1}		36770	4291		1.00	(16) OCC	42.28	141.48
Sus. + W3{1}		36770	3298		1.00	(16) OCC	41.94	141.48
Sus. + W4{1}		36770	3298		1.00	(16) OCC	41.94	141.48
A05 F+ Max P{1}						( 3) HOOP	80.50	117.90
GR + Max P{1}		21543			1.00	(15) SUST	35.55	117.90
TR:Amb to T1{1}				98110	1.00	(17) DISP	33.85	176.85
Amb to T1{1}				98110	1.00	(17) DISP	33.85	176.85
Sus. + E1{1}		21543	17357		1.00	(16) OCC	41.54	141.48
Sus. + E2{1}		21543	17357		1.00	(16) OCC	41.54	141.48
Sus. + E3{1}		21543	7700		1.00	(16) OCC	38.21	141.48
Sus. + E4{1}		21543	7700		1.00	(16) OCC	38.21	141.48
Sus. + W1{1}		21543	4932		1.00	(16) OCC	37.25	141.48
Sus. + W2{1}		21543	4932		1.00	(16) OCC	37.25	141.48



Sus. + W3{1}	21543	1603	1.00	(16)	OCC	36.10	141.48
Sus. + W4{1}	21543	1603	1.00	(16)	OCC	36.10	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )		S.I.F				
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A05 N-	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	22006			1.00	(15) SUST	35.71	117.90
	TR:Amb to T1{1}			102202	1.00	(17) DISP	35.26	176.85
	Amb to T1{1}			102202	1.00	(17) DISP	35.26	176.85
	Sus. + E1{1}	22006	14024		1.00	(16) OCC	40.55	141.48
	Sus. + E2{1}	22006	14024		1.00	(16) OCC	40.55	141.48
	Sus. + E3{1}	22006	9282		1.00	(16) OCC	38.91	141.48
	Sus. + E4{1}	22006	9282		1.00	(16) OCC	38.91	141.48
	Sus. + W1{1}	22006	3689		1.00	(16) OCC	36.98	141.48
	Sus. + W2{1}	22006	3689		1.00	(16) OCC	36.98	141.48
	Sus. + W3{1}	22006	2385		1.00	(16) OCC	36.53	141.48
	Sus. + W4{1}	22006	2385		1.00	(16) OCC	36.53	141.48
A04 F+	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	20234			1.00	(15) SUST	35.10	117.90
	TR:Amb to T1{1}			84008	1.00	(17) DISP	28.98	176.85
	Amb to T1{1}			84008	1.00	(17) DISP	28.98	176.85
	Sus. + E1{1}	20234	11508		1.00	(16) OCC	39.07	141.48
	Sus. + E2{1}	20234	11508		1.00	(16) OCC	39.07	141.48
	Sus. + E3{1}	20234	11787		1.00	(16) OCC	39.16	141.48
	Sus. + E4{1}	20234	11787		1.00	(16) OCC	39.16	141.48
	Sus. + W1{1}	20234	3061		1.00	(16) OCC	36.15	141.48
	Sus. + W2{1}	20234	3061		1.00	(16) OCC	36.15	141.48
	Sus. + W3{1}	20234	2836		1.00	(16) OCC	36.08	141.48
	Sus. + W4{1}	20234	2836		1.00	(16) OCC	36.08	141.48
A04 N+	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	20278			3.25	(15) SUST	45.19	117.90
	TR:Amb to T1{1}			58071	3.25	(17) DISP	65.19	176.85
	Amb to T1{1}			58071	3.25	(17) DISP	65.19	176.85
	Sus. + E1{1}	20278	17737		3.25	(16) OCC	60.12	141.48
	Sus. + E2{1}	20278	17737		3.25	(16) OCC	60.12	141.48
	Sus. + E3{1}	20278	9156		3.25	(16) OCC	52.90	141.48
	Sus. + E4{1}	20278	9156		3.25	(16) OCC	52.90	141.48
	Sus. + W1{1}	20278	5210		3.25	(16) OCC	49.58	141.48
	Sus. + W2{1}	20278	5210		3.25	(16) OCC	49.58	141.48
	Sus. + W3{1}	20278	2132		3.25	(16) OCC	46.99	141.48
	Sus. + W4{1}	20278	2132		3.25	(16) OCC	46.99	141.48
A04 N-	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	20278			1.00	(15) SUST	35.11	117.90
	TR:Amb to T1{1}			58071	1.00	(17) DISP	20.04	176.85
	Amb to T1{1}			58071	1.00	(17) DISP	20.04	176.85
	Sus. + E1{1}	20278	17737		1.00	(16) OCC	41.23	141.48
	Sus. + E2{1}	20278	17737		1.00	(16) OCC	41.23	141.48
	Sus. + E3{1}	20278	9156		1.00	(16) OCC	38.27	141.48
	Sus. + E4{1}	20278	9156		1.00	(16) OCC	38.27	141.48
	Sus. + W1{1}	20278	5210		1.00	(16) OCC	36.91	141.48
	Sus. + W2{1}	20278	5210		1.00	(16) OCC	36.91	141.48
	Sus. + W3{1}	20278	2132		1.00	(16) OCC	35.85	141.48
	Sus. + W4{1}	20278	2132		1.00	(16) OCC	35.85	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )		S.I.F				
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				

-----									
A03 +	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	53149				1.00	(15) SUST	46.45	117.90
	TR:Amb to T1{1}			46894		1.00	(17) DISP	16.18	176.85
	Amb to T1{1}			46894		1.00	(17) DISP	16.18	176.85
	Sus. + E1{1}	53149	23774			1.00	(16) OCC	54.66	141.48
	Sus. + E2{1}	53149	23774			1.00	(16) OCC	54.66	141.48
	Sus. + E3{1}	53149	27407			1.00	(16) OCC	55.91	141.48
	Sus. + E4{1}	53149	27407			1.00	(16) OCC	55.91	141.48
	Sus. + W1{1}	53149	6136			1.00	(16) OCC	48.57	141.48
	Sus. + W2{1}	53149	6136			1.00	(16) OCC	48.57	141.48
	Sus. + W3{1}	53149	6869			1.00	(16) OCC	48.82	141.48
	Sus. + W4{1}	53149	6869			1.00	(16) OCC	48.82	141.48
-----									
A03 -	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	53149				1.00	(15) SUST	46.45	117.90
	TR:Amb to T1{1}			46894		1.00	(17) DISP	16.18	176.85
	Amb to T1{1}			46894		1.00	(17) DISP	16.18	176.85
	Sus. + E1{1}	53149	23774			1.00	(16) OCC	54.66	141.48
	Sus. + E2{1}	53149	23774			1.00	(16) OCC	54.66	141.48
	Sus. + E3{1}	53149	27407			1.00	(16) OCC	55.91	141.48
	Sus. + E4{1}	53149	27407			1.00	(16) OCC	55.91	141.48
	Sus. + W1{1}	53149	6136			1.00	(16) OCC	48.57	141.48
	Sus. + W2{1}	53149	6136			1.00	(16) OCC	48.57	141.48
	Sus. + W3{1}	53149	6869			1.00	(16) OCC	48.82	141.48
	Sus. + W4{1}	53149	6869			1.00	(16) OCC	48.82	141.48
-----									
A02 F+	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	31105				1.00	(15) SUST	38.85	117.90
	TR:Amb to T1{1}			60887		1.00	(17) DISP	21.01	176.85
	Amb to T1{1}			60887		1.00	(17) DISP	21.01	176.85
	Sus. + E1{1}	31105	24756			1.00	(16) OCC	47.39	141.48
	Sus. + E2{1}	31105	24756			1.00	(16) OCC	47.39	141.48
	Sus. + E3{1}	31105	18295			1.00	(16) OCC	45.16	141.48
	Sus. + E4{1}	31105	18295			1.00	(16) OCC	45.16	141.48
	Sus. + W1{1}	31105	6047			1.00	(16) OCC	40.93	141.48
	Sus. + W2{1}	31105	6047			1.00	(16) OCC	40.93	141.48
	Sus. + W3{1}	31105	4230			1.00	(16) OCC	40.31	141.48
	Sus. + W4{1}	31105	4230			1.00	(16) OCC	40.31	141.48
-----									
A02 F-	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	31105				3.25	(15) SUST	54.30	117.90
	TR:Amb to T1{1}			60887		3.25	(17) DISP	68.35	176.85
	Amb to T1{1}			60887		3.25	(17) DISP	68.35	176.85
	Sus. + E1{1}	31105	24756			3.25	(16) OCC	75.15	141.48
	Sus. + E2{1}	31105	24756			3.25	(16) OCC	75.15	141.48
	Sus. + E3{1}	31105	18295			3.25	(16) OCC	69.71	141.48
	Sus. + E4{1}	31105	18295			3.25	(16) OCC	69.71	141.48
	Sus. + W1{1}	31105	6047			3.25	(16) OCC	59.40	141.48
	Sus. + W2{1}	31105	6047			3.25	(16) OCC	59.40	141.48
	Sus. + W3{1}	31105	4230			3.25	(16) OCC	57.87	141.48
	Sus. + W4{1}	31105	4230			3.25	(16) OCC	57.87	141.48

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-----									
ASME B31.1 (2014) CODE COMPLIANCE									
(Moments in N.m ) (Stress in N/mm2 )									
Point	Load	Ma	Mb	Mc	S.I.F	Eq. Load	Code	Code	
name	combination	(Sus.)	(Occ.)	(Exp.)		no. type	Stress	Allow.	
-----									
A02 N+	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	15044				3.25	(15) SUST	40.78	117.90
	TR:Amb to T1{1}			68075		3.25	(17) DISP	76.42	176.85
	Amb to T1{1}			68075		3.25	(17) DISP	76.42	176.85
	Sus. + E1{1}	15044	13117			3.25	(16) OCC	51.83	141.48
	Sus. + E2{1}	15044	13117			3.25	(16) OCC	51.83	141.48
	Sus. + E3{1}	15044	11004			3.25	(16) OCC	50.05	141.48
	Sus. + E4{1}	15044	11004			3.25	(16) OCC	50.05	141.48
	Sus. + W1{1}	15044	3043			3.25	(16) OCC	43.34	141.48
	Sus. + W2{1}	15044	3043			3.25	(16) OCC	43.34	141.48
	Sus. + W3{1}	15044	2311			3.25	(16) OCC	42.73	141.48
	Sus. + W4{1}	15044	2311			3.25	(16) OCC	42.73	141.48
-----									
A02 N-	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	15044				1.00	(15) SUST	33.31	117.90
	TR:Amb to T1{1}			68075		1.00	(17) DISP	23.49	176.85

	Amb to T1{1}			68075	1.00	(17)	DISP	23.49	176.85
	Sus. + E1{1}	15044	13117		1.00	(16)	OCC	37.83	141.48
	Sus. + E2{1}	15044	13117		1.00	(16)	OCC	37.83	141.48
	Sus. + E3{1}	15044	11004		1.00	(16)	OCC	37.10	141.48
	Sus. + E4{1}	15044	11004		1.00	(16)	OCC	37.10	141.48
	Sus. + W1{1}	15044	3043		1.00	(16)	OCC	34.36	141.48
	Sus. + W2{1}	15044	3043		1.00	(16)	OCC	34.36	141.48
	Sus. + W3{1}	15044	2311		1.00	(16)	OCC	34.10	141.48
	Sus. + W4{1}	15044	2311		1.00	(16)	OCC	34.10	141.48
A01	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	12857			1.00	(15)	SUST	32.55	117.90
	TR:Amb to T1{1}			66554	1.00	(17)	DISP	22.96	176.85
	Amb to T1{1}			66554	1.00	(17)	DISP	22.96	176.85
	Sus. + E1{1}	12857	5268		1.00	(16)	OCC	34.37	141.48
	Sus. + E2{1}	12857	5268		1.00	(16)	OCC	34.37	141.48
	Sus. + E3{1}	12857	10437		1.00	(16)	OCC	36.15	141.48
	Sus. + E4{1}	12857	10437		1.00	(16)	OCC	36.15	141.48
	Sus. + W1{1}	12857	885		1.00	(16)	OCC	32.86	141.48
	Sus. + W2{1}	12857	885		1.00	(16)	OCC	32.86	141.48
	Sus. + W3{1}	12857	2180		1.00	(16)	OCC	33.30	141.48
	Sus. + W4{1}	12857	2180		1.00	(16)	OCC	33.30	141.48

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R E S U L T     S U M M A R Y  
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Maximum sustained stress ratio

Point : A07 F  
Stress N/mm2 : 111.31  
Allowable N/mm2 : 117.90  
Ratio : 0.94  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A06 N  
Stress N/mm2 : 124.98  
Allowable N/mm2 : 176.85  
Ratio : 0.71  
Load combination : Max Range

Maximum occasional stress ratio

Point : A07 F  
Stress N/mm2 : 129.04  
Allowable N/mm2 : 141.48  
Ratio : 0.91  
Load combination : Sus. + E3{1}

Maximum hoop stress ratio

Point : A07 F  
Stress N/mm2 : 80.50  
Allowable N/mm2 : 117.90  
Ratio : 0.68  
Load combination : Max P{1}

## **LAMPIRAN D**

*GENERAL PIPE STRESS REPORT (HYDROTEST CONDITION  
WITHOUT EXPANSION JOINT, PIPE THICKNESS = 8,808 mm)*

Hydrotest Condition without Expansion  
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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A02 N+	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	19511			3.25	(15) SUST	44.54	117.90
	TR:Amb to T1{1}			201898	3.25	(17) DISP	226.65	176.85**
	with Sus. load margin						226.65	250.21
	Amb to T1{1}			201898	3.25	(17) DISP	226.65	176.85**
	with Sus. load margin						226.65	250.21
	Sus. + E1{1}	19511	8966		3.25	(16) OCC	52.09	141.48
	Sus. + E2{1}	19511	8966		3.25	(16) OCC	52.09	141.48
	Sus. + E3{1}	19511	11093		3.25	(16) OCC	53.88	141.48
	Sus. + E4{1}	19511	11093		3.25	(16) OCC	53.88	141.48
	Sus. + W1{1}	19511	2499		3.25	(16) OCC	46.65	141.48
	Sus. + W2{1}	19511	2499		3.25	(16) OCC	46.65	141.48
	Sus. + W3{1}	19511	2666		3.25	(16) OCC	46.79	141.48
	Sus. + W4{1}	19511	2666		3.25	(16) OCC	46.79	141.48
A02 F-	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	27920			3.25	(15) SUST	51.62	117.90
	TR:Amb to T1{1}			192402	3.25	(17) DISP	215.99	176.85**
	with Sus. load margin						215.99	243.13
	Amb to T1{1}			192402	3.25	(17) DISP	215.99	176.85**
	with Sus. load margin						215.99	243.13
	Sus. + E1{1}	27920	7089		3.25	(16) OCC	57.59	141.48
	Sus. + E2{1}	27920	7089		3.25	(16) OCC	57.59	141.48
	Sus. + E3{1}	27920	11581		3.25	(16) OCC	61.37	141.48
	Sus. + E4{1}	27920	11581		3.25	(16) OCC	61.37	141.48
	Sus. + W1{1}	27920	2233		3.25	(16) OCC	53.50	141.48
	Sus. + W2{1}	27920	2233		3.25	(16) OCC	53.50	141.48
	Sus. + W3{1}	27920	2834		3.25	(16) OCC	54.01	141.48
	Sus. + W4{1}	27920	2834		3.25	(16) OCC	54.01	141.48
A04 N+	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	26577			3.25	(15) SUST	50.49	117.90
	TR:Amb to T1{1}			150440	3.25	(17) DISP	168.88	176.85
	Amb to T1{1}			150440	3.25	(17) DISP	168.88	176.85
	Sus. + E1{1}	26577	16022		3.25	(16) OCC	63.98	141.48
	Sus. + E2{1}	26577	16022		3.25	(16) OCC	63.98	141.48
	Sus. + E3{1}	26577	7174		3.25	(16) OCC	56.53	141.48
	Sus. + E4{1}	26577	7174		3.25	(16) OCC	56.53	141.48
	Sus. + W1{1}	26577	5519		3.25	(16) OCC	55.14	141.48
	Sus. + W2{1}	26577	5519		3.25	(16) OCC	55.14	141.48
	Sus. + W3{1}	26577	1628		3.25	(16) OCC	51.86	141.48
	Sus. + W4{1}	26577	1628		3.25	(16) OCC	51.86	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A05 F-	Max P{1}					( 3) HOOP	80.50	117.90
	GR + Max P{1}	12288			3.25	(15) SUST	38.46	117.90
	TR:Amb to T1{1}			141866	3.25	(17) DISP	159.26	176.85
	Amb to T1{1}			141866	3.25	(17) DISP	159.26	176.85
	Sus. + E1{1}	12288	10952		3.25	(16) OCC	47.68	141.48
	Sus. + E2{1}	12288	10952		3.25	(16) OCC	47.68	141.48
	Sus. + E3{1}	12288	2852		3.25	(16) OCC	40.86	141.48
	Sus. + E4{1}	12288	2852		3.25	(16) OCC	40.86	141.48
	Sus. + W1{1}	12288	3824		3.25	(16) OCC	41.68	141.48
	Sus. + W2{1}	12288	3824		3.25	(16) OCC	41.68	141.48

	Sus. + W3{1}	12288	791		3.25	(16)	OCC	39.13	141.48
	Sus. + W4{1}	12288	791		3.25	(16)	OCC	39.13	141.48
A05 N+	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	9018			3.25	(15)	SUST	35.71	117.90
	TR:Amb to T1{1}			121513	3.25	(17)	DISP	136.41	176.85
	Amb to T1{1}			121513	3.25	(17)	DISP	136.41	176.85
	Sus. + E1{1}	9018	6925		3.25	(16)	OCC	41.54	141.48
	Sus. + E2{1}	9018	6925		3.25	(16)	OCC	41.54	141.48
	Sus. + E3{1}	9018	6306		3.25	(16)	OCC	41.02	141.48
	Sus. + E4{1}	9018	6306		3.25	(16)	OCC	41.02	141.48
	Sus. + W1{1}	9018	2343		3.25	(16)	OCC	37.68	141.48
	Sus. + W2{1}	9018	2343		3.25	(16)	OCC	37.68	141.48
	Sus. + W3{1}	9018	2109		3.25	(16)	OCC	37.49	141.48
	Sus. + W4{1}	9018	2109		3.25	(16)	OCC	37.49	141.48
A06 N+	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	36498			6.81	(15)	SUST	92.47	117.90
	TR:Amb to T1{1}			52225	6.81	(17)	DISP	122.78	176.85
	Amb to T1{1}			52225	6.81	(17)	DISP	122.78	176.85
	Sus. + E1{1}	36498	12236		6.81	(16)	OCC	114.05	141.48
	Sus. + E2{1}	36498	12236		6.81	(16)	OCC	114.05	141.48
	Sus. + E3{1}	36498	9851		6.81	(16)	OCC	109.84	141.48
	Sus. + E4{1}	36498	9851		6.81	(16)	OCC	109.84	141.48
	Sus. + W1{1}	36498	4100		6.81	(16)	OCC	99.70	141.48
	Sus. + W2{1}	36498	4100		6.81	(16)	OCC	99.70	141.48
	Sus. + W3{1}	36498	3286		6.81	(16)	OCC	98.26	141.48
	Sus. + W4{1}	36498	3286		6.81	(16)	OCC	98.26	141.48
A06 F-	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	36675			6.81	(15)	SUST	92.78	117.90
	TR:Amb to T1{1}			52175	6.81	(17)	DISP	122.66	176.85
	Amb to T1{1}			52175	6.81	(17)	DISP	122.66	176.85
	Sus. + E1{1}	36675	12220		6.81	(16)	OCC	114.33	141.48
	Sus. + E2{1}	36675	12220		6.81	(16)	OCC	114.33	141.48
	Sus. + E3{1}	36675	10254		6.81	(16)	OCC	110.86	141.48
	Sus. + E4{1}	36675	10254		6.81	(16)	OCC	110.86	141.48
	Sus. + W1{1}	36675	4028		6.81	(16)	OCC	99.88	141.48
	Sus. + W2{1}	36675	4028		6.81	(16)	OCC	99.88	141.48
	Sus. + W3{1}	36675	3403		6.81	(16)	OCC	98.78	141.48
	Sus. + W4{1}	36675	3403		6.81	(16)	OCC	98.78	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type		
A09 N+	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	34840			3.25	(15)	SUST	57.45	117.90
	TR:Amb to T1{1}			97416	3.25	(17)	DISP	109.36	176.85
	Amb to T1{1}			97416	3.25	(17)	DISP	109.36	176.85
	Sus. + E1{1}	34840	3981		3.25	(16)	OCC	60.80	141.48
	Sus. + E2{1}	34840	3981		3.25	(16)	OCC	60.80	141.48
	Sus. + E3{1}	34840	2695		3.25	(16)	OCC	59.72	141.48
	Sus. + E4{1}	34840	2695		3.25	(16)	OCC	59.72	141.48
	Sus. + W1{1}	34840	863		3.25	(16)	OCC	58.18	141.48
	Sus. + W2{1}	34840	863		3.25	(16)	OCC	58.18	141.48
	Sus. + W3{1}	34840	944		3.25	(16)	OCC	58.24	141.48
	Sus. + W4{1}	34840	944		3.25	(16)	OCC	58.24	141.48
A03 +	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	71306			1.00	(15)	SUST	52.72	117.90
	TR:Amb to T1{1}			288604	1.00	(17)	DISP	99.57	176.85
	Amb to T1{1}			288604	1.00	(17)	DISP	99.57	176.85
	Sus. + E1{1}	71306	14384		1.00	(16)	OCC	57.68	141.48
	Sus. + E2{1}	71306	14384		1.00	(16)	OCC	57.68	141.48
	Sus. + E3{1}	71306	33924		1.00	(16)	OCC	64.42	141.48
	Sus. + E4{1}	71306	33924		1.00	(16)	OCC	64.42	141.48
	Sus. + W1{1}	71306	5024		1.00	(16)	OCC	54.45	141.48
	Sus. + W2{1}	71306	5024		1.00	(16)	OCC	54.45	141.48
	Sus. + W3{1}	71306	8548		1.00	(16)	OCC	55.67	141.48
	Sus. + W4{1}	71306	8548		1.00	(16)	OCC	55.67	141.48
A03 -	Max P{1}					( 3)	HOOP	80.50	117.90

GR + Max P{1}	71306		1.00	(15)	SUST	52.72	117.90
TR:Amb to T1{1}			288604	1.00	(17)	DISP	99.57 176.85
Amb to T1{1}			288604	1.00	(17)	DISP	99.57 176.85
Sus. + E1{1}	71306	14384		1.00	(16)	OCC	57.68 141.48
Sus. + E2{1}	71306	14384		1.00	(16)	OCC	57.68 141.48
Sus. + E3{1}	71306	33924		1.00	(16)	OCC	64.42 141.48
Sus. + E4{1}	71306	33924		1.00	(16)	OCC	64.42 141.48
Sus. + W1{1}	71306	5024		1.00	(16)	OCC	54.45 141.48
Sus. + W2{1}	71306	5024		1.00	(16)	OCC	54.45 141.48
Sus. + W3{1}	71306	8548		1.00	(16)	OCC	55.67 141.48
Sus. + W4{1}	71306	8548		1.00	(16)	OCC	55.67 141.48
-----							
A07 F- Max P{1}					( 3)	HOOP	80.50 117.90
GR + Max P{1}	34128			6.81	(15)	SUST	88.29 117.90
TR:Amb to T1{1}				36681	(17)	DISP	86.24 176.85
Amb to T1{1}				36681	(17)	DISP	86.24 176.85
Sus. + E1{1}	34128	3915		6.81	(16)	OCC	95.20 141.48
Sus. + E2{1}	34128	3915		6.81	(16)	OCC	95.20 141.48
Sus. + E3{1}	34128	6373		6.81	(16)	OCC	99.53 141.48
Sus. + E4{1}	34128	6373		6.81	(16)	OCC	99.53 141.48
Sus. + W1{1}	34128	2262		6.81	(16)	OCC	92.28 141.48
Sus. + W2{1}	34128	2262		6.81	(16)	OCC	92.28 141.48
Sus. + W3{1}	34128	1924		6.81	(16)	OCC	91.69 141.48
Sus. + W4{1}	34128	1924		6.81	(16)	OCC	91.69 141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A07 N+	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	32003			6.81	(15)	SUST	84.54	117.90
	TR:Amb to T1{1}			39850	6.81	(17)	DISP	93.68	176.85
	Amb to T1{1}			39850	6.81	(17)	DISP	93.68	176.85
	Sus. + E1{1}	32003	3827		6.81	(16)	OCC	91.29	141.48
	Sus. + E2{1}	32003	3827		6.81	(16)	OCC	91.29	141.48
	Sus. + E3{1}	32003	7161		6.81	(16)	OCC	97.17	141.48
	Sus. + E4{1}	32003	7161		6.81	(16)	OCC	97.17	141.48
	Sus. + W1{1}	32003	1630		6.81	(16)	OCC	87.42	141.48
	Sus. + W2{1}	32003	1630		6.81	(16)	OCC	87.42	141.48
	Sus. + W3{1}	32003	2166		6.81	(16)	OCC	88.36	141.48
	Sus. + W4{1}	32003	2166		6.81	(16)	OCC	88.36	141.48
-----									
A08 +	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	26306			1.00	(15)	SUST	37.19	117.90
	TR:Amb to T1{1}			278431	1.00	(17)	DISP	96.06	176.85
	Amb to T1{1}			278431	1.00	(17)	DISP	96.06	176.85
	Sus. + E1{1}	26306	51628		1.00	(16)	OCC	55.00	141.48
	Sus. + E2{1}	26306	51628		1.00	(16)	OCC	55.00	141.48
	Sus. + E3{1}	26306	32914		1.00	(16)	OCC	48.55	141.48
	Sus. + E4{1}	26306	32914		1.00	(16)	OCC	48.55	141.48
	Sus. + W1{1}	26306	22805		1.00	(16)	OCC	45.06	141.48
	Sus. + W2{1}	26306	22805		1.00	(16)	OCC	45.06	141.48
	Sus. + W3{1}	26306	11005		1.00	(16)	OCC	40.99	141.48
	Sus. + W4{1}	26306	11005		1.00	(16)	OCC	40.99	141.48
-----									
A08 -	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	26306			1.00	(15)	SUST	37.19	117.90
	TR:Amb to T1{1}			278431	1.00	(17)	DISP	96.06	176.85
	Amb to T1{1}			278431	1.00	(17)	DISP	96.06	176.85
	Sus. + E1{1}	26306	51628		1.00	(16)	OCC	55.00	141.48
	Sus. + E2{1}	26306	51628		1.00	(16)	OCC	55.00	141.48
	Sus. + E3{1}	26306	32914		1.00	(16)	OCC	48.55	141.48
	Sus. + E4{1}	26306	32914		1.00	(16)	OCC	48.55	141.48
	Sus. + W1{1}	26306	22805		1.00	(16)	OCC	45.06	141.48
	Sus. + W2{1}	26306	22805		1.00	(16)	OCC	45.06	141.48
	Sus. + W3{1}	26306	11005		1.00	(16)	OCC	40.99	141.48
	Sus. + W4{1}	26306	11005		1.00	(16)	OCC	40.99	141.48
-----									
A04 F-	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	11425			3.25	(15)	SUST	37.74	117.90
	TR:Amb to T1{1}			81706	3.25	(17)	DISP	91.72	176.85
	Amb to T1{1}			81706	3.25	(17)	DISP	91.72	176.85
	Sus. + E1{1}	11425	8925		3.25	(16)	OCC	45.25	141.48

Sus. + E2{1}	11425	8925	3.25	(16)	OCC	45.25	141.48
Sus. + E3{1}	11425	5949	3.25	(16)	OCC	42.74	141.48
Sus. + E4{1}	11425	5949	3.25	(16)	OCC	42.74	141.48
Sus. + W1{1}	11425	3004	3.25	(16)	OCC	40.26	141.48
Sus. + W2{1}	11425	3004	3.25	(16)	OCC	40.26	141.48
Sus. + W3{1}	11425	1575	3.25	(16)	OCC	39.06	141.48
Sus. + W4{1}	11425	1575	3.25	(16)	OCC	39.06	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A10 +	Max P{1}				( 3)	HOOP	80.50	117.90
	GR + Max P{1}	172426			1.00	(15) SUST	87.61	117.90
	TR:Amb to T1{1}			18877	1.00	(17) DISP	6.51	176.85
	Amb to T1{1}			18877	1.00	(17) DISP	6.51	176.85
	Sus. + E1{1}	172426	1117		1.00	(16) OCC	87.99	141.48
	Sus. + E2{1}	172426	1117		1.00	(16) OCC	87.99	141.48
	Sus. + E3{1}	172426	2737		1.00	(16) OCC	88.55	141.48
	Sus. + E4{1}	172426	2737		1.00	(16) OCC	88.55	141.48
	Sus. + W1{1}	172426	1651		1.00	(16) OCC	88.18	141.48
	Sus. + W2{1}	172426	1651		1.00	(16) OCC	88.18	141.48
	Sus. + W3{1}	172426	915		1.00	(16) OCC	87.92	141.48
	Sus. + W4{1}	172426	915		1.00	(16) OCC	87.92	141.48
A10 -	Max P{1}				( 3)	HOOP	80.50	117.90
	GR + Max P{1}	172426			1.00	(15) SUST	87.61	117.90
	TR:Amb to T1{1}			18877	1.00	(17) DISP	6.51	176.85
	Amb to T1{1}			18877	1.00	(17) DISP	6.51	176.85
	Sus. + E1{1}	172426	1117		1.00	(16) OCC	87.99	141.48
	Sus. + E2{1}	172426	1117		1.00	(16) OCC	87.99	141.48
	Sus. + E3{1}	172426	2737		1.00	(16) OCC	88.55	141.48
	Sus. + E4{1}	172426	2737		1.00	(16) OCC	88.55	141.48
	Sus. + W1{1}	172426	1651		1.00	(16) OCC	88.18	141.48
	Sus. + W2{1}	172426	1651		1.00	(16) OCC	88.18	141.48
	Sus. + W3{1}	172426	915		1.00	(16) OCC	87.92	141.48
	Sus. + W4{1}	172426	915		1.00	(16) OCC	87.92	141.48
A09 F-	Max P{1}				( 3)	HOOP	80.50	117.90
	GR + Max P{1}	61602			3.25	(15) SUST	79.98	117.90
	TR:Amb to T1{1}			78373	3.25	(17) DISP	87.98	176.85
	Amb to T1{1}			78373	3.25	(17) DISP	87.98	176.85
	Sus. + E1{1}	61602	1927		3.25	(16) OCC	81.60	141.48
	Sus. + E2{1}	61602	1927		3.25	(16) OCC	81.60	141.48
	Sus. + E3{1}	61602	2788		3.25	(16) OCC	82.33	141.48
	Sus. + E4{1}	61602	2788		3.25	(16) OCC	82.33	141.48
	Sus. + W1{1}	61602	1713		3.25	(16) OCC	81.42	141.48
	Sus. + W2{1}	61602	1713		3.25	(16) OCC	81.42	141.48
	Sus. + W3{1}	61602	811		3.25	(16) OCC	80.66	141.48
	Sus. + W4{1}	61602	811		3.25	(16) OCC	80.66	141.48
A15	Max P{1}				( 3)	HOOP	80.50	117.90
	GR + Max P{1}	8119			1.00	(15) SUST	30.92	117.90
	TR:Amb to T1{1}			10932	1.00	(17) DISP	3.77	176.85
	Amb to T1{1}			10932	1.00	(17) DISP	3.77	176.85
	Sus. + E1{1}	8119	31692		1.00	(16) OCC	41.85	141.48
	Sus. + E2{1}	8119	31692		1.00	(16) OCC	41.85	141.48
	Sus. + E3{1}	8119	31113		1.00	(16) OCC	41.65	141.48
	Sus. + E4{1}	8119	31113		1.00	(16) OCC	41.65	141.48
	Sus. + W1{1}	8119	17540		1.00	(16) OCC	36.97	141.48
	Sus. + W2{1}	8119	17540		1.00	(16) OCC	36.97	141.48
	Sus. + W3{1}	8119	13685		1.00	(16) OCC	35.64	141.48
	Sus. + W4{1}	8119	13685		1.00	(16) OCC	35.64	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Load type		
A14 F+	Max P{1}						( 3) HOOP	80.50	117.90
	GR + Max P{1}	12935			1.00	(15) SUST		32.58	117.90
	TR:Amb to T1{1}			24530	1.00	(17) DISP		8.46	176.85
	Amb to T1{1}			24530	1.00	(17) DISP		8.46	176.85
	Sus. + E1{1}	12935	14170		1.00	(16) OCC		37.47	141.48
	Sus. + E2{1}	12935	14170		1.00	(16) OCC		37.47	141.48
	Sus. + E3{1}	12935	7017		1.00	(16) OCC		35.00	141.48
	Sus. + E4{1}	12935	7017		1.00	(16) OCC		35.00	141.48
	Sus. + W1{1}	12935	6937		1.00	(16) OCC		34.97	141.48
	Sus. + W2{1}	12935	6937		1.00	(16) OCC		34.97	141.48
	Sus. + W3{1}	12935	3282		1.00	(16) OCC		33.71	141.48
	Sus. + W4{1}	12935	3282		1.00	(16) OCC		33.71	141.48
A14 F-	Max P{1}						( 3) HOOP	80.50	117.90
	GR + Max P{1}	12935			3.25	(15) SUST		39.01	117.90
	TR:Amb to T1{1}			24530	3.25	(17) DISP		27.54	176.85
	Amb to T1{1}			24530	3.25	(17) DISP		27.54	176.85
	Sus. + E1{1}	12935	14170		3.25	(16) OCC		50.94	141.48
	Sus. + E2{1}	12935	14170		3.25	(16) OCC		50.94	141.48
	Sus. + E3{1}	12935	7017		3.25	(16) OCC		44.92	141.48
	Sus. + E4{1}	12935	7017		3.25	(16) OCC		44.92	141.48
	Sus. + W1{1}	12935	6937		3.25	(16) OCC		44.85	141.48
	Sus. + W2{1}	12935	6937		3.25	(16) OCC		44.85	141.48
	Sus. + W3{1}	12935	3282		3.25	(16) OCC		41.77	141.48
	Sus. + W4{1}	12935	3282		3.25	(16) OCC		41.77	141.48
A14 N+	Max P{1}						( 3) HOOP	80.50	117.90
	GR + Max P{1}	5161			3.25	(15) SUST		32.46	117.90
	TR:Amb to T1{1}			15110	3.25	(17) DISP		16.96	176.85
	Amb to T1{1}			15110	3.25	(17) DISP		16.96	176.85
	Sus. + E1{1}	5161	10641		3.25	(16) OCC		41.42	141.48
	Sus. + E2{1}	5161	10641		3.25	(16) OCC		41.42	141.48
	Sus. + E3{1}	5161	5878		3.25	(16) OCC		37.41	141.48
	Sus. + E4{1}	5161	5878		3.25	(16) OCC		37.41	141.48
	Sus. + W1{1}	5161	4819		3.25	(16) OCC		36.52	141.48
	Sus. + W2{1}	5161	4819		3.25	(16) OCC		36.52	141.48
	Sus. + W3{1}	5161	2854		3.25	(16) OCC		34.87	141.48
	Sus. + W4{1}	5161	2854		3.25	(16) OCC		34.87	141.48
A14 N-	Max P{1}						( 3) HOOP	80.50	117.90
	GR + Max P{1}	5161			1.00	(15) SUST		29.90	117.90
	TR:Amb to T1{1}			15110	1.00	(17) DISP		5.21	176.85
	Amb to T1{1}			15110	1.00	(17) DISP		5.21	176.85
	Sus. + E1{1}	5161	10641		1.00	(16) OCC		33.57	141.48
	Sus. + E2{1}	5161	10641		1.00	(16) OCC		33.57	141.48
	Sus. + E3{1}	5161	5878		1.00	(16) OCC		31.93	141.48
	Sus. + E4{1}	5161	5878		1.00	(16) OCC		31.93	141.48
	Sus. + W1{1}	5161	4819		1.00	(16) OCC		31.56	141.48
	Sus. + W2{1}	5161	4819		1.00	(16) OCC		31.56	141.48
	Sus. + W3{1}	5161	2854		1.00	(16) OCC		30.88	141.48
	Sus. + W4{1}	5161	2854		1.00	(16) OCC		30.88	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Load type		
A13 F+	Max P{1}						( 3) HOOP	80.50	117.90
	GR + Max P{1}	14232			1.00	(15) SUST		33.03	117.90
	TR:Amb to T1{1}			38116	1.00	(17) DISP		13.15	176.85
	Amb to T1{1}			38116	1.00	(17) DISP		13.15	176.85
	Sus. + E1{1}	14232	8216		1.00	(16) OCC		35.86	141.48
	Sus. + E2{1}	14232	8216		1.00	(16) OCC		35.86	141.48
	Sus. + E3{1}	14232	3746		1.00	(16) OCC		34.32	141.48
	Sus. + E4{1}	14232	3746		1.00	(16) OCC		34.32	141.48
	Sus. + W1{1}	14232	4651		1.00	(16) OCC		34.63	141.48
	Sus. + W2{1}	14232	4651		1.00	(16) OCC		34.63	141.48
	Sus. + W3{1}	14232	1657		1.00	(16) OCC		33.60	141.48

	Sus. + W4{1}	14232	1657		1.00	(16)	OCC	33.60	141.48
A13 F-	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	14232			3.25	(15)	SUST	40.10	117.90
	TR:Amb to T1{1}			38116	3.25	(17)	DISP	42.79	176.85
	Amb to T1{1}			38116	3.25	(17)	DISP	42.79	176.85
	Sus. + E1{1}	14232	8216		3.25	(16)	OCC	47.02	141.48
	Sus. + E2{1}	14232	8216		3.25	(16)	OCC	47.02	141.48
	Sus. + E3{1}	14232	3746		3.25	(16)	OCC	43.25	141.48
	Sus. + E4{1}	14232	3746		3.25	(16)	OCC	43.25	141.48
	Sus. + W1{1}	14232	4651		3.25	(16)	OCC	44.02	141.48
	Sus. + W2{1}	14232	4651		3.25	(16)	OCC	44.02	141.48
	Sus. + W3{1}	14232	1657		3.25	(16)	OCC	41.49	141.48
	Sus. + W4{1}	14232	1657		3.25	(16)	OCC	41.49	141.48
A13 N+	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	6744			3.25	(15)	SUST	33.79	117.90
	TR:Amb to T1{1}			47547	3.25	(17)	DISP	53.38	176.85
	Amb to T1{1}			47547	3.25	(17)	DISP	53.38	176.85
	Sus. + E1{1}	6744	10710		3.25	(16)	OCC	42.81	141.48
	Sus. + E2{1}	6744	10710		3.25	(16)	OCC	42.81	141.48
	Sus. + E3{1}	6744	4634		3.25	(16)	OCC	37.70	141.48
	Sus. + E4{1}	6744	4634		3.25	(16)	OCC	37.70	141.48
	Sus. + W1{1}	6744	6183		3.25	(16)	OCC	39.00	141.48
	Sus. + W2{1}	6744	6183		3.25	(16)	OCC	39.00	141.48
	Sus. + W3{1}	6744	2281		3.25	(16)	OCC	35.72	141.48
	Sus. + W4{1}	6744	2281		3.25	(16)	OCC	35.72	141.48
A13 N-	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	6744			1.00	(15)	SUST	30.44	117.90
	TR:Amb to T1{1}			47547	1.00	(17)	DISP	16.40	176.85
	Amb to T1{1}			47547	1.00	(17)	DISP	16.40	176.85
	Sus. + E1{1}	6744	10710		1.00	(16)	OCC	34.14	141.48
	Sus. + E2{1}	6744	10710		1.00	(16)	OCC	34.14	141.48
	Sus. + E3{1}	6744	4634		1.00	(16)	OCC	32.04	141.48
	Sus. + E4{1}	6744	4634		1.00	(16)	OCC	32.04	141.48
	Sus. + W1{1}	6744	6183		1.00	(16)	OCC	32.58	141.48
	Sus. + W2{1}	6744	6183		1.00	(16)	OCC	32.58	141.48
	Sus. + W3{1}	6744	2281		1.00	(16)	OCC	31.23	141.48
	Sus. + W4{1}	6744	2281		1.00	(16)	OCC	31.23	141.48

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ASME B31.1 (2014) CODE COMPLIANCE										
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.	
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type			
A12 +	Max P{1}						( 3)	HOOP	80.50	117.90
	GR + Max P{1}	30032			1.00	(15)	SUST	38.48	117.90	
	TR:Amb to T1{1}			20206	1.00	(17)	DISP	6.97	176.85	
	Amb to T1{1}			20206	1.00	(17)	DISP	6.97	176.85	
	Sus. + E1{1}	30032	6927		1.00	(16)	OCC	40.87	141.48	
	Sus. + E2{1}	30032	6927		1.00	(16)	OCC	40.87	141.48	
	Sus. + E3{1}	30032	8141		1.00	(16)	OCC	41.29	141.48	
	Sus. + E4{1}	30032	8141		1.00	(16)	OCC	41.29	141.48	
	Sus. + W1{1}	30032	4707		1.00	(16)	OCC	40.10	141.48	
	Sus. + W2{1}	30032	4707		1.00	(16)	OCC	40.10	141.48	
	Sus. + W3{1}	30032	2737		1.00	(16)	OCC	39.42	141.48	
	Sus. + W4{1}	30032	2737		1.00	(16)	OCC	39.42	141.48	
A12 -	Max P{1}						( 3)	HOOP	80.50	117.90
	GR + Max P{1}	30032			1.00	(15)	SUST	38.48	117.90	
	TR:Amb to T1{1}			20206	1.00	(17)	DISP	6.97	176.85	
	Amb to T1{1}			20206	1.00	(17)	DISP	6.97	176.85	
	Sus. + E1{1}	30032	6927		1.00	(16)	OCC	40.87	141.48	
	Sus. + E2{1}	30032	6927		1.00	(16)	OCC	40.87	141.48	
	Sus. + E3{1}	30032	8141		1.00	(16)	OCC	41.29	141.48	
	Sus. + E4{1}	30032	8141		1.00	(16)	OCC	41.29	141.48	
	Sus. + W1{1}	30032	4707		1.00	(16)	OCC	40.10	141.48	
	Sus. + W2{1}	30032	4707		1.00	(16)	OCC	40.10	141.48	
	Sus. + W3{1}	30032	2737		1.00	(16)	OCC	39.42	141.48	
	Sus. + W4{1}	30032	2737		1.00	(16)	OCC	39.42	141.48	
A11 F+	Max P{1}						( 3)	HOOP	80.50	117.90
	GR + Max P{1}	29094			1.00	(15)	SUST	38.15	117.90	

TR:Amb to T1{1}			22886	1.00	(17)	DISP	7.90	176.85
Amb to T1{1}			22886	1.00	(17)	DISP	7.90	176.85
Sus. + E1{1}	29094	6708		1.00	(16)	OCC	40.47	141.48
Sus. + E2{1}	29094	6708		1.00	(16)	OCC	40.47	141.48
Sus. + E3{1}	29094	7426		1.00	(16)	OCC	40.72	141.48
Sus. + E4{1}	29094	7426		1.00	(16)	OCC	40.72	141.48
Sus. + W1{1}	29094	4613		1.00	(16)	OCC	39.75	141.48
Sus. + W2{1}	29094	4613		1.00	(16)	OCC	39.75	141.48
Sus. + W3{1}	29094	2577		1.00	(16)	OCC	39.04	141.48
Sus. + W4{1}	29094	2577		1.00	(16)	OCC	39.04	141.48
All F- Max P{1}					( 3)	HOOP	80.50	117.90
GR + Max P{1}	29094			3.25	(15)	SUST	52.61	117.90
TR:Amb to T1{1}			22886	3.25	(17)	DISP	25.69	176.85
Amb to T1{1}			22886	3.25	(17)	DISP	25.69	176.85
Sus. + E1{1}	29094	6708		3.25	(16)	OCC	58.26	141.48
Sus. + E2{1}	29094	6708		3.25	(16)	OCC	58.26	141.48
Sus. + E3{1}	29094	7426		3.25	(16)	OCC	58.86	141.48
Sus. + E4{1}	29094	7426		3.25	(16)	OCC	58.86	141.48
Sus. + W1{1}	29094	4613		3.25	(16)	OCC	56.50	141.48
Sus. + W2{1}	29094	4613		3.25	(16)	OCC	56.50	141.48
Sus. + W3{1}	29094	2577		3.25	(16)	OCC	54.78	141.48
Sus. + W4{1}	29094	2577		3.25	(16)	OCC	54.78	141.48

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		ASME B31.1 (2014) CODE COMPLIANCE							
		(Moments in N.m )		(Stress in N/mm2 )					
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.	
All N+	Max P{1}					( 3) HOOP	80.50	117.90	
	GR + Max P{1}	20887			3.25	(15) SUST	45.70	117.90	
	TR:Amb to T1{1}			52805	3.25	(17) DISP	59.28	176.85	
	Amb to T1{1}			52805	3.25	(17) DISP	59.28	176.85	
	Sus. + E1{1}	20887	3017		3.25	(16) OCC	48.24	141.48	
	Sus. + E2{1}	20887	3017		3.25	(16) OCC	48.24	141.48	
	Sus. + E3{1}	20887	1614		3.25	(16) OCC	47.06	141.48	
	Sus. + E4{1}	20887	1614		3.25	(16) OCC	47.06	141.48	
	Sus. + W1{1}	20887	2561		3.25	(16) OCC	47.86	141.48	
	Sus. + W2{1}	20887	2561		3.25	(16) OCC	47.86	141.48	
	Sus. + W3{1}	20887	1022		3.25	(16) OCC	46.56	141.48	
	Sus. + W4{1}	20887	1022		3.25	(16) OCC	46.56	141.48	
All N-	Max P{1}					( 3) HOOP	80.50	117.90	
	GR + Max P{1}	20887			1.00	(15) SUST	35.32	117.90	
	TR:Amb to T1{1}			52805	1.00	(17) DISP	18.22	176.85	
	Amb to T1{1}			52805	1.00	(17) DISP	18.22	176.85	
	Sus. + E1{1}	20887	3017		1.00	(16) OCC	36.36	141.48	
	Sus. + E2{1}	20887	3017		1.00	(16) OCC	36.36	141.48	
	Sus. + E3{1}	20887	1614		1.00	(16) OCC	35.88	141.48	
	Sus. + E4{1}	20887	1614		1.00	(16) OCC	35.88	141.48	
	Sus. + W1{1}	20887	2561		1.00	(16) OCC	36.21	141.48	
	Sus. + W2{1}	20887	2561		1.00	(16) OCC	36.21	141.48	
	Sus. + W3{1}	20887	1022		1.00	(16) OCC	35.68	141.48	
	Sus. + W4{1}	20887	1022		1.00	(16) OCC	35.68	141.48	
A09 F+	Max P{1}					( 3) HOOP	80.50	117.90	
	GR + Max P{1}	61602			1.00	(15) SUST	49.37	117.90	
	TR:Amb to T1{1}			78373	1.00	(17) DISP	27.04	176.85	
	Amb to T1{1}			78373	1.00	(17) DISP	27.04	176.85	
	Sus. + E1{1}	61602	1927		1.00	(16) OCC	50.03	141.48	
	Sus. + E2{1}	61602	1927		1.00	(16) OCC	50.03	141.48	
	Sus. + E3{1}	61602	2788		1.00	(16) OCC	50.33	141.48	
	Sus. + E4{1}	61602	2788		1.00	(16) OCC	50.33	141.48	
	Sus. + W1{1}	61602	1713		1.00	(16) OCC	49.96	141.48	
	Sus. + W2{1}	61602	1713		1.00	(16) OCC	49.96	141.48	
	Sus. + W3{1}	61602	811		1.00	(16) OCC	49.65	141.48	
	Sus. + W4{1}	61602	811		1.00	(16) OCC	49.65	141.48	
A09 N-	Max P{1}					( 3) HOOP	80.50	117.90	
	GR + Max P{1}	34840			1.00	(15) SUST	40.14	117.90	
	TR:Amb to T1{1}			97416	1.00	(17) DISP	33.61	176.85	
	Amb to T1{1}			97416	1.00	(17) DISP	33.61	176.85	
	Sus. + E1{1}	34840	3981		1.00	(16) OCC	41.51	141.48	
	Sus. + E2{1}	34840	3981		1.00	(16) OCC	41.51	141.48	

Sus. + E3{1}	34840	2695	1.00	(16)	OCC	41.07	141.48
Sus. + E4{1}	34840	2695	1.00	(16)	OCC	41.07	141.48
Sus. + W1{1}	34840	863	1.00	(16)	OCC	40.43	141.48
Sus. + W2{1}	34840	863	1.00	(16)	OCC	40.43	141.48
Sus. + W3{1}	34840	944	1.00	(16)	OCC	40.46	141.48
Sus. + W4{1}	34840	944	1.00	(16)	OCC	40.46	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F			
A07 F+	Max P{1}						( 3) HOOP	80.50	117.90
	GR + Max P{1}	34128			1.00		(15) SUST	39.89	117.90
	TR:Amb to T1{1}			36681	1.00		(17) DISP	12.66	176.85
	Amb to T1{1}			36681	1.00		(17) DISP	12.66	176.85
	Sus. + E1{1}	34128	3915		1.00		(16) OCC	41.24	141.48
	Sus. + E2{1}	34128	3915		1.00		(16) OCC	41.24	141.48
	Sus. + E3{1}	34128	6373		1.00		(16) OCC	42.09	141.48
	Sus. + E4{1}	34128	6373		1.00		(16) OCC	42.09	141.48
	Sus. + W1{1}	34128	2262		1.00		(16) OCC	40.67	141.48
	Sus. + W2{1}	34128	2262		1.00		(16) OCC	40.67	141.48
	Sus. + W3{1}	34128	1924		1.00		(16) OCC	40.56	141.48
	Sus. + W4{1}	34128	1924		1.00		(16) OCC	40.56	141.48
A07 N-	Max P{1}						( 3) HOOP	80.50	117.90
	GR + Max P{1}	32003			1.00		(15) SUST	39.16	117.90
	TR:Amb to T1{1}			39850	1.00		(17) DISP	13.75	176.85
	Amb to T1{1}			39850	1.00		(17) DISP	13.75	176.85
	Sus. + E1{1}	32003	3827		1.00		(16) OCC	40.48	141.48
	Sus. + E2{1}	32003	3827		1.00		(16) OCC	40.48	141.48
	Sus. + E3{1}	32003	7161		1.00		(16) OCC	41.63	141.48
	Sus. + E4{1}	32003	7161		1.00		(16) OCC	41.63	141.48
	Sus. + W1{1}	32003	1630		1.00		(16) OCC	39.72	141.48
	Sus. + W2{1}	32003	1630		1.00		(16) OCC	39.72	141.48
	Sus. + W3{1}	32003	2166		1.00		(16) OCC	39.90	141.48
	Sus. + W4{1}	32003	2166		1.00		(16) OCC	39.90	141.48
A06 F+	Max P{1}						( 3) HOOP	80.50	117.90
	GR + Max P{1}	36675			1.00		(15) SUST	40.77	117.90
	TR:Amb to T1{1}			52175	1.00		(17) DISP	18.00	176.85
	Amb to T1{1}			52175	1.00		(17) DISP	18.00	176.85
	Sus. + E1{1}	36675	12220		1.00		(16) OCC	44.99	141.48
	Sus. + E2{1}	36675	12220		1.00		(16) OCC	44.99	141.48
	Sus. + E3{1}	36675	10254		1.00		(16) OCC	44.31	141.48
	Sus. + E4{1}	36675	10254		1.00		(16) OCC	44.31	141.48
	Sus. + W1{1}	36675	4028		1.00		(16) OCC	42.16	141.48
	Sus. + W2{1}	36675	4028		1.00		(16) OCC	42.16	141.48
	Sus. + W3{1}	36675	3403		1.00		(16) OCC	41.94	141.48
	Sus. + W4{1}	36675	3403		1.00		(16) OCC	41.94	141.48
A06 N-	Max P{1}						( 3) HOOP	80.50	117.90
	GR + Max P{1}	36498			1.00		(15) SUST	40.71	117.90
	TR:Amb to T1{1}			52225	1.00		(17) DISP	18.02	176.85
	Amb to T1{1}			52225	1.00		(17) DISP	18.02	176.85
	Sus. + E1{1}	36498	12236		1.00		(16) OCC	44.93	141.48
	Sus. + E2{1}	36498	12236		1.00		(16) OCC	44.93	141.48
	Sus. + E3{1}	36498	9851		1.00		(16) OCC	44.11	141.48
	Sus. + E4{1}	36498	9851		1.00		(16) OCC	44.11	141.48
	Sus. + W1{1}	36498	4100		1.00		(16) OCC	42.12	141.48
	Sus. + W2{1}	36498	4100		1.00		(16) OCC	42.12	141.48
	Sus. + W3{1}	36498	3286		1.00		(16) OCC	41.84	141.48
	Sus. + W4{1}	36498	3286		1.00		(16) OCC	41.84	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A05 F+	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	12288			1.00	(15)	SUST	32.36	117.90
	TR:Amb to T1{1}			141866	1.00	(17)	DISP	48.95	176.85
	Amb to T1{1}			141866	1.00	(17)	DISP	48.95	176.85
	Sus. + E1{1}	12288	10952		1.00	(16)	OCC	36.13	141.48
	Sus. + E2{1}	12288	10952		1.00	(16)	OCC	36.13	141.48
	Sus. + E3{1}	12288	2852		1.00	(16)	OCC	33.34	141.48
	Sus. + E4{1}	12288	2852		1.00	(16)	OCC	33.34	141.48
	Sus. + W1{1}	12288	3824		1.00	(16)	OCC	33.68	141.48
	Sus. + W2{1}	12288	3824		1.00	(16)	OCC	33.68	141.48
	Sus. + W3{1}	12288	791		1.00	(16)	OCC	32.63	141.48
	Sus. + W4{1}	12288	791		1.00	(16)	OCC	32.63	141.48
A05 N-	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	9018			1.00	(15)	SUST	31.23	117.90
	TR:Amb to T1{1}			121513	1.00	(17)	DISP	41.92	176.85
	Amb to T1{1}			121513	1.00	(17)	DISP	41.92	176.85
	Sus. + E1{1}	9018	6925		1.00	(16)	OCC	33.62	141.48
	Sus. + E2{1}	9018	6925		1.00	(16)	OCC	33.62	141.48
	Sus. + E3{1}	9018	6306		1.00	(16)	OCC	33.40	141.48
	Sus. + E4{1}	9018	6306		1.00	(16)	OCC	33.40	141.48
	Sus. + W1{1}	9018	2343		1.00	(16)	OCC	32.04	141.48
	Sus. + W2{1}	9018	2343		1.00	(16)	OCC	32.04	141.48
	Sus. + W3{1}	9018	2109		1.00	(16)	OCC	31.96	141.48
	Sus. + W4{1}	9018	2109		1.00	(16)	OCC	31.96	141.48
A04 F+	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	11425			1.00	(15)	SUST	32.06	117.90
	TR:Amb to T1{1}			81706	1.00	(17)	DISP	28.19	176.85
	Amb to T1{1}			81706	1.00	(17)	DISP	28.19	176.85
	Sus. + E1{1}	11425	8925		1.00	(16)	OCC	35.14	141.48
	Sus. + E2{1}	11425	8925		1.00	(16)	OCC	35.14	141.48
	Sus. + E3{1}	11425	5949		1.00	(16)	OCC	34.11	141.48
	Sus. + E4{1}	11425	5949		1.00	(16)	OCC	34.11	141.48
	Sus. + W1{1}	11425	3004		1.00	(16)	OCC	33.09	141.48
	Sus. + W2{1}	11425	3004		1.00	(16)	OCC	33.09	141.48
	Sus. + W3{1}	11425	1575		1.00	(16)	OCC	32.60	141.48
	Sus. + W4{1}	11425	1575		1.00	(16)	OCC	32.60	141.48
A04 N-	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	26577			1.00	(15)	SUST	37.29	117.90
	TR:Amb to T1{1}			150440	1.00	(17)	DISP	51.90	176.85
	Amb to T1{1}			150440	1.00	(17)	DISP	51.90	176.85
	Sus. + E1{1}	26577	16022		1.00	(16)	OCC	42.81	141.48
	Sus. + E2{1}	26577	16022		1.00	(16)	OCC	42.81	141.48
	Sus. + E3{1}	26577	7174		1.00	(16)	OCC	39.76	141.48
	Sus. + E4{1}	26577	7174		1.00	(16)	OCC	39.76	141.48
	Sus. + W1{1}	26577	5519		1.00	(16)	OCC	39.19	141.48
	Sus. + W2{1}	26577	5519		1.00	(16)	OCC	39.19	141.48
	Sus. + W3{1}	26577	1628		1.00	(16)	OCC	37.85	141.48
	Sus. + W4{1}	26577	1628		1.00	(16)	OCC	37.85	141.48

Hydrotest Condition without Expansion  
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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A02 F+	Max P{1}					( 3)	HOOP	80.50	117.90
	GR + Max P{1}	27920			1.00	(15)	SUST	37.75	117.90
	TR:Amb to T1{1}			192402	1.00	(17)	DISP	66.38	176.85
	Amb to T1{1}			192402	1.00	(17)	DISP	66.38	176.85
	Sus. + E1{1}	27920	7089		1.00	(16)	OCC	40.20	141.48
	Sus. + E2{1}	27920	7089		1.00	(16)	OCC	40.20	141.48
	Sus. + E3{1}	27920	11581		1.00	(16)	OCC	41.74	141.48
	Sus. + E4{1}	27920	11581		1.00	(16)	OCC	41.74	141.48
	Sus. + W1{1}	27920	2233		1.00	(16)	OCC	38.52	141.48
	Sus. + W2{1}	27920	2233		1.00	(16)	OCC	38.52	141.48
	Sus. + W3{1}	27920	2834		1.00	(16)	OCC	38.73	141.48
	Sus. + W4{1}	27920	2834		1.00	(16)	OCC	38.73	141.48

A02 N-	Max P{1}			( 3)	HOOP	80.50	117.90
	GR + Max P{1}	19511		1.00	(15) SUST	34.85	117.90
	TR:Amb to Tl{1}		201898	1.00	(17) DISP	69.66	176.85
	Amb to Tl{1}		201898	1.00	(17) DISP	69.66	176.85
	Sus. + E1{1}	19511	8966	1.00	(16) OCC	37.94	141.48
	Sus. + E2{1}	19511	8966	1.00	(16) OCC	37.94	141.48
	Sus. + E3{1}	19511	11093	1.00	(16) OCC	38.67	141.48
	Sus. + E4{1}	19511	11093	1.00	(16) OCC	38.67	141.48
	Sus. + W1{1}	19511	2499	1.00	(16) OCC	35.71	141.48
	Sus. + W2{1}	19511	2499	1.00	(16) OCC	35.71	141.48
	Sus. + W3{1}	19511	2666	1.00	(16) OCC	35.77	141.48
	Sus. + W4{1}	19511	2666	1.00	(16) OCC	35.77	141.48
A00	Max P{1}			( 3)	HOOP	80.50	117.90
	GR + Max P{1}	24707		1.00	(15) SUST	36.64	117.90
	TR:Amb to Tl{1}		208685	1.00	(17) DISP	72.00	176.85
	Amb to Tl{1}		208685	1.00	(17) DISP	72.00	176.85
	Sus. + E1{1}	24707	19311	1.00	(16) OCC	43.30	141.48
	Sus. + E2{1}	24707	19311	1.00	(16) OCC	43.30	141.48
	Sus. + E3{1}	24707	19338	1.00	(16) OCC	43.31	141.48
	Sus. + E4{1}	24707	19338	1.00	(16) OCC	43.31	141.48
	Sus. + W1{1}	24707	5150	1.00	(16) OCC	38.42	141.48
	Sus. + W2{1}	24707	5150	1.00	(16) OCC	38.42	141.48
	Sus. + W3{1}	24707	4527	1.00	(16) OCC	38.20	141.48
	Sus. + W4{1}	24707	4527	1.00	(16) OCC	38.20	141.48

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R E S U L T   S U M M A R Y  
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Maximum sustained stress ratio

Point : A06 F  
Stress N/mm2 : 92.78  
Allowable N/mm2 : 117.90  
Ratio : 0.79  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A04 N  
Stress N/mm2 : 168.88  
Allowable N/mm2 : 176.85  
Ratio : 0.95  
Load combination : Max Range

Maximum occasional stress ratio

Point : A06 F  
Stress N/mm2 : 114.33  
Allowable N/mm2 : 141.48  
Ratio : 0.81  
Load combination : Sus. + E1{1}

Maximum hoop stress ratio

Point : A02 N  
Stress N/mm2 : 80.50  
Allowable N/mm2 : 117.90  
Ratio : 0.68  
Load combination : Max P{1}

## **LAMPIRAN E**

*GENERAL PIPE STRESS REPORT (HYDROTEST CONDITION WITH  
EXPANSION JOINT, PIPE THICKNESS = 8,501 mm)*

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A07 F-	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	46586			6.85	(15) SUST	114.57	117.90
	TR:Amb to T1{1}			15718	6.85	(17) DISP	38.44	176.85
	Amb to T1{1}			15718	6.85	(17) DISP	38.44	176.85
	Sus. + E1{1}	46586	4006		6.85	(16) OCC	121.92	141.48
	Sus. + E2{1}	46586	4006		6.85	(16) OCC	121.92	141.48
	Sus. + E3{1}	46586	9900		6.85	(16) OCC	132.73	141.48
	Sus. + E4{1}	46586	9900		6.85	(16) OCC	132.73	141.48
	Sus. + W1{1}	46586	2366		6.85	(16) OCC	118.91	141.48
	Sus. + W2{1}	46586	2366		6.85	(16) OCC	118.91	141.48
	Sus. + W3{1}	46586	2530		6.85	(16) OCC	119.21	141.48
	Sus. + W4{1}	46586	2530		6.85	(16) OCC	119.21	141.48
A07 N+	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	44673			6.85	(15) SUST	111.06	117.90
	TR:Amb to T1{1}			12817	6.85	(17) DISP	31.34	176.85
	Amb to T1{1}			12817	6.85	(17) DISP	31.34	176.85
	Sus. + E1{1}	44673	4886		6.85	(16) OCC	120.02	141.48
	Sus. + E2{1}	44673	4886		6.85	(16) OCC	120.02	141.48
	Sus. + E3{1}	44673	10294		6.85	(16) OCC	129.94	141.48
	Sus. + E4{1}	44673	10294		6.85	(16) OCC	129.94	141.48
	Sus. + W1{1}	44673	1681		6.85	(16) OCC	114.15	141.48
	Sus. + W2{1}	44673	1681		6.85	(16) OCC	114.15	141.48
	Sus. + W3{1}	44673	2702		6.85	(16) OCC	116.02	141.48
	Sus. + W4{1}	44673	2702		6.85	(16) OCC	116.02	141.48
A06 N+	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	36449			6.85	(15) SUST	95.98	117.90
	TR:Amb to T1{1}			50862	6.85	(17) DISP	124.37	176.85
	Amb to T1{1}			50862	6.85	(17) DISP	124.37	176.85
	Sus. + E1{1}	36449	14275		6.85	(16) OCC	122.16	141.48
	Sus. + E2{1}	36449	14275		6.85	(16) OCC	122.16	141.48
	Sus. + E3{1}	36449	11080		6.85	(16) OCC	116.30	141.48
	Sus. + E4{1}	36449	11080		6.85	(16) OCC	116.30	141.48
	Sus. + W1{1}	36449	4278		6.85	(16) OCC	103.83	141.48
	Sus. + W2{1}	36449	4278		6.85	(16) OCC	103.83	141.48
	Sus. + W3{1}	36449	3286		6.85	(16) OCC	102.01	141.48
	Sus. + W4{1}	36449	3286		6.85	(16) OCC	102.01	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A06 F-	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	36630			6.85	(15) SUST	96.31	117.90
	TR:Amb to T1{1}			48295	6.85	(17) DISP	118.10	176.85
	Amb to T1{1}			48295	6.85	(17) DISP	118.10	176.85
	Sus. + E1{1}	36630	13913		6.85	(16) OCC	121.83	141.48
	Sus. + E2{1}	36630	13913		6.85	(16) OCC	121.83	141.48
	Sus. + E3{1}	36630	11288		6.85	(16) OCC	117.02	141.48
	Sus. + E4{1}	36630	11288		6.85	(16) OCC	117.02	141.48
	Sus. + W1{1}	36630	4126		6.85	(16) OCC	103.88	141.48
	Sus. + W2{1}	36630	4126		6.85	(16) OCC	103.88	141.48
	Sus. + W3{1}	36630	3362		6.85	(16) OCC	102.48	141.48
	Sus. + W4{1}	36630	3362		6.85	(16) OCC	102.48	141.48
A05 N+	Max P{1}					( 3) HOOP	84.24	117.90



GR + Max P{1}	21745		3.24	(15)	SUST	47.98	117.90
TR:Amb to T1{1}			97535	3.24	(17)	DISP	112.73 176.85
Amb to T1{1}			97535	3.24	(17)	DISP	112.73 176.85
Sus. + E1{1}	21745	13788		3.24	(16)	OCC	59.93 141.48
Sus. + E2{1}	21745	13788		3.24	(16)	OCC	59.93 141.48
Sus. + E3{1}	21745	9138		3.24	(16)	OCC	55.90 141.48
Sus. + E4{1}	21745	9138		3.24	(16)	OCC	55.90 141.48
Sus. + W1{1}	21745	3673		3.24	(16)	OCC	51.17 141.48
Sus. + W2{1}	21745	3673		3.24	(16)	OCC	51.17 141.48
Sus. + W3{1}	21745	2371		3.24	(16)	OCC	50.04 141.48
Sus. + W4{1}	21745	2371		3.24	(16)	OCC	50.04 141.48
A05 F- Max P{1}							
GR + Max P{1}	21290			( 3)	HOOP	84.24	117.90
TR:Amb to T1{1}				3.24	(15)	SUST	47.59 117.90
Amb to T1{1}			93683	3.24	(17)	DISP	108.28 176.85
Sus. + E1{1}	21290	17103	93683	3.24	(17)	DISP	108.28 176.85
Sus. + E2{1}	21290	17103		3.24	(16)	OCC	62.41 141.48
Sus. + E3{1}	21290	7581		3.24	(16)	OCC	54.16 141.48
Sus. + E4{1}	21290	7581		3.24	(16)	OCC	54.16 141.48
Sus. + W1{1}	21290	4918		3.24	(16)	OCC	51.85 141.48
Sus. + W2{1}	21290	4918		3.24	(16)	OCC	51.85 141.48
Sus. + W3{1}	21290	1593		3.24	(16)	OCC	48.97 141.48
Sus. + W4{1}	21290	1593		3.24	(16)	OCC	48.97 141.48
A10 + Max P{1}							
GR + Max P{1}	180780			( 3)	HOOP	84.24	117.90
TR:Amb to T1{1}				1.00	(15)	SUST	93.66 117.90
Amb to T1{1}			52554	1.00	(17)	DISP	18.76 176.85
Sus. + E1{1}	180780	5581	52554	1.00	(17)	DISP	18.76 176.85
Sus. + E2{1}	180780	5581		1.00	(16)	OCC	95.66 141.48
Sus. + E3{1}	180780	4557		1.00	(16)	OCC	95.29 141.48
Sus. + E4{1}	180780	4557		1.00	(16)	OCC	95.29 141.48
Sus. + W1{1}	180780	1767		1.00	(16)	OCC	94.30 141.48
Sus. + W2{1}	180780	1767		1.00	(16)	OCC	94.30 141.48
Sus. + W3{1}	180780	1132		1.00	(16)	OCC	94.07 141.48
Sus. + W4{1}	180780	1132		1.00	(16)	OCC	94.07 141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			Eq. no.	Load type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )					
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F			
A10 - Max P{1}					( 3)	HOOP	84.24 117.90	
GR + Max P{1}	180780				1.00	(15) SUST	93.66 117.90	
TR:Amb to T1{1}				52554	1.00	(17) DISP	18.76 176.85	
Amb to T1{1}				52554	1.00	(17) DISP	18.76 176.85	
Sus. + E1{1}	180780	5581			1.00	(16) OCC	95.66 141.48	
Sus. + E2{1}	180780	5581			1.00	(16) OCC	95.66 141.48	
Sus. + E3{1}	180780	4557			1.00	(16) OCC	95.29 141.48	
Sus. + E4{1}	180780	4557			1.00	(16) OCC	95.29 141.48	
Sus. + W1{1}	180780	1767			1.00	(16) OCC	94.30 141.48	
Sus. + W2{1}	180780	1767			1.00	(16) OCC	94.30 141.48	
Sus. + W3{1}	180780	1132			1.00	(16) OCC	94.07 141.48	
Sus. + W4{1}	180780	1132			1.00	(16) OCC	94.07 141.48	
A04 F- Max P{1}								
GR + Max P{1}	20015				3.24	(15) SUST	46.48 117.90	
TR:Amb to T1{1}				80322	3.24	(17) DISP	92.83 176.85	
Amb to T1{1}				80322	3.24	(17) DISP	92.83 176.85	
Sus. + E1{1}	20015	11317			3.24	(16) OCC	56.29 141.48	
Sus. + E2{1}	20015	11317			3.24	(16) OCC	56.29 141.48	
Sus. + E3{1}	20015	11620			3.24	(16) OCC	56.55 141.48	
Sus. + E4{1}	20015	11620			3.24	(16) OCC	56.55 141.48	
Sus. + W1{1}	20015	3044			3.24	(16) OCC	49.12 141.48	
Sus. + W2{1}	20015	3044			3.24	(16) OCC	49.12 141.48	
Sus. + W3{1}	20015	2822			3.24	(16) OCC	48.93 141.48	
Sus. + W4{1}	20015	2822			3.24	(16) OCC	48.93 141.48	
A09 F- Max P{1}								
GR + Max P{1}	67066				3.24	(15) SUST	87.27 117.90	
TR:Amb to T1{1}				76293	3.24	(17) DISP	88.18 176.85	
Amb to T1{1}				76293	3.24	(17) DISP	88.18 176.85	
Sus. + E1{1}	67066	4699			3.24	(16) OCC	91.34 141.48	

Sus. + E2{1}	67066	4699	3.24	(16)	OCC	91.34	141.48
Sus. + E3{1}	67066	6039	3.24	(16)	OCC	92.50	141.48
Sus. + E4{1}	67066	6039	3.24	(16)	OCC	92.50	141.48
Sus. + W1{1}	67066	1963	3.24	(16)	OCC	88.97	141.48
Sus. + W2{1}	67066	1963	3.24	(16)	OCC	88.97	141.48
Sus. + W3{1}	67066	1421	3.24	(16)	OCC	88.50	141.48
Sus. + W4{1}	67066	1421	3.24	(16)	OCC	88.50	141.48

A09 N+ Max P{1}				( 3)	HOOP	84.24	117.90	
GR + Max P{1}	36738		3.24	(15)	SUST	60.98	117.90	
TR:Amb to T1{1}			74085	3.24	(17)	DISP	85.63	176.85
Amb to T1{1}			74085	3.24	(17)	DISP	85.63	176.85
Sus. + E1{1}	36738	6138	3.24	(16)	OCC	66.30	141.48	
Sus. + E2{1}	36738	6138	3.24	(16)	OCC	66.30	141.48	
Sus. + E3{1}	36738	6912	3.24	(16)	OCC	66.97	141.48	
Sus. + E4{1}	36738	6912	3.24	(16)	OCC	66.97	141.48	
Sus. + W1{1}	36738	1608	3.24	(16)	OCC	62.37	141.48	
Sus. + W2{1}	36738	1608	3.24	(16)	OCC	62.37	141.48	
Sus. + W3{1}	36738	1802	3.24	(16)	OCC	62.54	141.48	
Sus. + W4{1}	36738	1802	3.24	(16)	OCC	62.54	141.48	

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ASME B31.1 (2014) CODE COMPLIANCE  
(Moments in N.m ) (Stress in N/mm2 )

Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type	Code Stress	Code Allow.
A15	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	9283			1.00	(15)	SUST	32.45	117.90
	TR:Amb to T1{1}			24149	1.00	(17)	DISP	8.62	176.85
	Amb to T1{1}			24149	1.00	(17)	DISP	8.62	176.85
	Sus. + E1{1}	9283	32078		1.00	(16)	OCC	43.90	141.48
	Sus. + E2{1}	9283	32078		1.00	(16)	OCC	43.90	141.48
	Sus. + E3{1}	9283	33301		1.00	(16)	OCC	44.33	141.48
	Sus. + E4{1}	9283	33301		1.00	(16)	OCC	44.33	141.48
	Sus. + W1{1}	9283	18729		1.00	(16)	OCC	39.13	141.48
	Sus. + W2{1}	9283	18729		1.00	(16)	OCC	39.13	141.48
	Sus. + W3{1}	9283	14987		1.00	(16)	OCC	37.80	141.48
	Sus. + W4{1}	9283	14987		1.00	(16)	OCC	37.80	141.48
A14 F+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	14951			1.00	(15)	SUST	34.47	117.90
	TR:Amb to T1{1}			38863	1.00	(17)	DISP	13.87	176.85
	Amb to T1{1}			38863	1.00	(17)	DISP	13.87	176.85
	Sus. + E1{1}	14951	16574		1.00	(16)	OCC	40.39	141.48
	Sus. + E2{1}	14951	16574		1.00	(16)	OCC	40.39	141.48
	Sus. + E3{1}	14951	7914		1.00	(16)	OCC	37.29	141.48
	Sus. + E4{1}	14951	7914		1.00	(16)	OCC	37.29	141.48
	Sus. + W1{1}	14951	8160		1.00	(16)	OCC	37.38	141.48
	Sus. + W2{1}	14951	8160		1.00	(16)	OCC	37.38	141.48
	Sus. + W3{1}	14951	3875		1.00	(16)	OCC	35.85	141.48
	Sus. + W4{1}	14951	3875		1.00	(16)	OCC	35.85	141.48
A14 F-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	14951			3.24	(15)	SUST	42.09	117.90
	TR:Amb to T1{1}			38863	3.24	(17)	DISP	44.92	176.85
	Amb to T1{1}			38863	3.24	(17)	DISP	44.92	176.85
	Sus. + E1{1}	14951	16574		3.24	(16)	OCC	56.46	141.48
	Sus. + E2{1}	14951	16574		3.24	(16)	OCC	56.46	141.48
	Sus. + E3{1}	14951	7914		3.24	(16)	OCC	48.95	141.48
	Sus. + E4{1}	14951	7914		3.24	(16)	OCC	48.95	141.48
	Sus. + W1{1}	14951	8160		3.24	(16)	OCC	49.17	141.48
	Sus. + W2{1}	14951	8160		3.24	(16)	OCC	49.17	141.48
	Sus. + W3{1}	14951	3875		3.24	(16)	OCC	45.45	141.48
	Sus. + W4{1}	14951	3875		3.24	(16)	OCC	45.45	141.48
A14 N+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	5615			3.24	(15)	SUST	34.00	117.90
	TR:Amb to T1{1}			24848	3.24	(17)	DISP	28.72	176.85
	Amb to T1{1}			24848	3.24	(17)	DISP	28.72	176.85
	Sus. + E1{1}	5615	13009		3.24	(16)	OCC	45.28	141.48
	Sus. + E2{1}	5615	13009		3.24	(16)	OCC	45.28	141.48
	Sus. + E3{1}	5615	6248		3.24	(16)	OCC	39.41	141.48
	Sus. + E4{1}	5615	6248		3.24	(16)	OCC	39.41	141.48
	Sus. + W1{1}	5615	5761		3.24	(16)	OCC	38.99	141.48

Sus. + W2{1}	5615	5761	3.24	(16)	OCC	38.99	141.48
Sus. + W3{1}	5615	3210	3.24	(16)	OCC	36.78	141.48
Sus. + W4{1}	5615	3210	3.24	(16)	OCC	36.78	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )	Ma (Sus.)	Mb (Occ.)			
A14 N-	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	5615			1.00	(15) SUST	31.14	117.90
	TR:Amb to Tl{1}			24848	1.00	(17) DISP	8.87	176.85
	Amb to Tl{1}			24848	1.00	(17) DISP	8.87	176.85
	Sus. + E1{1}	5615	13009		1.00	(16) OCC	35.78	141.48
	Sus. + E2{1}	5615	13009		1.00	(16) OCC	35.78	141.48
	Sus. + E3{1}	5615	6248		1.00	(16) OCC	33.37	141.48
	Sus. + E4{1}	5615	6248		1.00	(16) OCC	33.37	141.48
	Sus. + W1{1}	5615	5761		1.00	(16) OCC	33.19	141.48
	Sus. + W2{1}	5615	5761		1.00	(16) OCC	33.19	141.48
	Sus. + W3{1}	5615	3210		1.00	(16) OCC	32.28	141.48
	Sus. + W4{1}	5615	3210		1.00	(16) OCC	32.28	141.48
A13 F+	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	15584			1.00	(15) SUST	34.69	117.90
	TR:Amb to Tl{1}			47406	1.00	(17) DISP	16.92	176.85
	Amb to Tl{1}			47406	1.00	(17) DISP	16.92	176.85
	Sus. + E1{1}	15584	8346		1.00	(16) OCC	37.67	141.48
	Sus. + E2{1}	15584	8346		1.00	(16) OCC	37.67	141.48
	Sus. + E3{1}	15584	3812		1.00	(16) OCC	36.06	141.48
	Sus. + E4{1}	15584	3812		1.00	(16) OCC	36.06	141.48
	Sus. + W1{1}	15584	4712		1.00	(16) OCC	36.38	141.48
	Sus. + W2{1}	15584	4712		1.00	(16) OCC	36.38	141.48
	Sus. + W3{1}	15584	1778		1.00	(16) OCC	35.33	141.48
	Sus. + W4{1}	15584	1778		1.00	(16) OCC	35.33	141.48
A13 F-	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	15584			3.24	(15) SUST	42.64	117.90
	TR:Amb to Tl{1}			47406	3.24	(17) DISP	54.79	176.85
	Amb to Tl{1}			47406	3.24	(17) DISP	54.79	176.85
	Sus. + E1{1}	15584	8346		3.24	(16) OCC	49.88	141.48
	Sus. + E2{1}	15584	8346		3.24	(16) OCC	49.88	141.48
	Sus. + E3{1}	15584	3812		3.24	(16) OCC	45.95	141.48
	Sus. + E4{1}	15584	3812		3.24	(16) OCC	45.95	141.48
	Sus. + W1{1}	15584	4712		3.24	(16) OCC	46.73	141.48
	Sus. + W2{1}	15584	4712		3.24	(16) OCC	46.73	141.48
	Sus. + W3{1}	15584	1778		3.24	(16) OCC	44.18	141.48
	Sus. + W4{1}	15584	1778		3.24	(16) OCC	44.18	141.48
A13 N+	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	9251			3.24	(15) SUST	37.15	117.90
	TR:Amb to Tl{1}			61602	3.24	(17) DISP	71.20	176.85
	Amb to Tl{1}			61602	3.24	(17) DISP	71.20	176.85
	Sus. + E1{1}	9251	10625		3.24	(16) OCC	46.36	141.48
	Sus. + E2{1}	9251	10625		3.24	(16) OCC	46.36	141.48
	Sus. + E3{1}	9251	5108		3.24	(16) OCC	41.58	141.48
	Sus. + E4{1}	9251	5108		3.24	(16) OCC	41.58	141.48
	Sus. + W1{1}	9251	6564		3.24	(16) OCC	42.84	141.48
	Sus. + W2{1}	9251	6564		3.24	(16) OCC	42.84	141.48
	Sus. + W3{1}	9251	2631		3.24	(16) OCC	39.43	141.48
	Sus. + W4{1}	9251	2631		3.24	(16) OCC	39.43	141.48

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Point	Load	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load	Code	Code
		(Moments in N.m )	(Stress in N/mm2 )	Ma	Mb			

name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no.	type	Stress	Allow.
A13 N-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	9251			1.00	(15)	SUST	32.43	117.90
	TR:Amb to T1{1}			61602	1.00	(17)	DISP	21.99	176.85
	Amb to T1{1}			61602	1.00	(17)	DISP	21.99	176.85
	Sus. + E1{1}	9251	10625		1.00	(16)	OCC	36.23	141.48
	Sus. + E2{1}	9251	10625		1.00	(16)	OCC	36.23	141.48
	Sus. + E3{1}	9251	5108		1.00	(16)	OCC	34.26	141.48
	Sus. + E4{1}	9251	5108		1.00	(16)	OCC	34.26	141.48
	Sus. + W1{1}	9251	6564		1.00	(16)	OCC	34.78	141.48
	Sus. + W2{1}	9251	6564		1.00	(16)	OCC	34.78	141.48
	Sus. + W3{1}	9251	2631		1.00	(16)	OCC	33.37	141.48
	Sus. + W4{1}	9251	2631		1.00	(16)	OCC	33.37	141.48
A12 +	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	33069			1.00	(15)	SUST	40.94	117.90
	TR:Amb to T1{1}			34272	1.00	(17)	DISP	12.23	176.85
	Amb to T1{1}			34272	1.00	(17)	DISP	12.23	176.85
	Sus. + E1{1}	33069	8099		1.00	(16)	OCC	43.83	141.48
	Sus. + E2{1}	33069	8099		1.00	(16)	OCC	43.83	141.48
	Sus. + E3{1}	33069	8970		1.00	(16)	OCC	44.14	141.48
	Sus. + E4{1}	33069	8970		1.00	(16)	OCC	44.14	141.48
	Sus. + W1{1}	33069	4989		1.00	(16)	OCC	42.72	141.48
	Sus. + W2{1}	33069	4989		1.00	(16)	OCC	42.72	141.48
	Sus. + W3{1}	33069	3188		1.00	(16)	OCC	42.07	141.48
	Sus. + W4{1}	33069	3188		1.00	(16)	OCC	42.07	141.48
A12 -	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	33069			1.00	(15)	SUST	40.94	117.90
	TR:Amb to T1{1}			34272	1.00	(17)	DISP	12.23	176.85
	Amb to T1{1}			34272	1.00	(17)	DISP	12.23	176.85
	Sus. + E1{1}	33069	8099		1.00	(16)	OCC	43.83	141.48
	Sus. + E2{1}	33069	8099		1.00	(16)	OCC	43.83	141.48
	Sus. + E3{1}	33069	8970		1.00	(16)	OCC	44.14	141.48
	Sus. + E4{1}	33069	8970		1.00	(16)	OCC	44.14	141.48
	Sus. + W1{1}	33069	4989		1.00	(16)	OCC	42.72	141.48
	Sus. + W2{1}	33069	4989		1.00	(16)	OCC	42.72	141.48
	Sus. + W3{1}	33069	3188		1.00	(16)	OCC	42.07	141.48
	Sus. + W4{1}	33069	3188		1.00	(16)	OCC	42.07	141.48
A11 F+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	32183			1.00	(15)	SUST	40.62	117.90
	TR:Amb to T1{1}			35717	1.00	(17)	DISP	12.75	176.85
	Amb to T1{1}			35717	1.00	(17)	DISP	12.75	176.85
	Sus. + E1{1}	32183	7604		1.00	(16)	OCC	43.33	141.48
	Sus. + E2{1}	32183	7604		1.00	(16)	OCC	43.33	141.48
	Sus. + E3{1}	32183	8325		1.00	(16)	OCC	43.59	141.48
	Sus. + E4{1}	32183	8325		1.00	(16)	OCC	43.59	141.48
	Sus. + W1{1}	32183	4837		1.00	(16)	OCC	42.35	141.48
	Sus. + W2{1}	32183	4837		1.00	(16)	OCC	42.35	141.48
	Sus. + W3{1}	32183	3034		1.00	(16)	OCC	41.70	141.48
	Sus. + W4{1}	32183	3034		1.00	(16)	OCC	41.70	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. no.	Load type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )						
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)					
A11 F-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	32183			3.24	(15)	SUST	57.03	117.90
	TR:Amb to T1{1}			35717	3.24	(17)	DISP	41.28	176.85
	Amb to T1{1}			35717	3.24	(17)	DISP	41.28	176.85
	Sus. + E1{1}	32183	7604		3.24	(16)	OCC	63.62	141.48
	Sus. + E2{1}	32183	7604		3.24	(16)	OCC	63.62	141.48
	Sus. + E3{1}	32183	8325		3.24	(16)	OCC	64.25	141.48
	Sus. + E4{1}	32183	8325		3.24	(16)	OCC	64.25	141.48
	Sus. + W1{1}	32183	4837		3.24	(16)	OCC	61.22	141.48
	Sus. + W2{1}	32183	4837		3.24	(16)	OCC	61.22	141.48
	Sus. + W3{1}	32183	3034		3.24	(16)	OCC	59.66	141.48
	Sus. + W4{1}	32183	3034		3.24	(16)	OCC	59.66	141.48
A11 N+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	21404			3.24	(15)	SUST	47.69	117.90

TR:Amb to T1{1}			39715	3.24	(17)	DISP	45.90	176.85
Amb to T1{1}			39715	3.24	(17)	DISP	45.90	176.85
Sus. + E1{1}	21404	2930		3.24	(16)	OCC	50.22	141.48
Sus. + E2{1}	21404	2930		3.24	(16)	OCC	50.22	141.48
Sus. + E3{1}	21404	2649		3.24	(16)	OCC	49.98	141.48
Sus. + E4{1}	21404	2649		3.24	(16)	OCC	49.98	141.48
Sus. + W1{1}	21404	2107		3.24	(16)	OCC	49.51	141.48
Sus. + W2{1}	21404	2107		3.24	(16)	OCC	49.51	141.48
Sus. + W3{1}	21404	1416		3.24	(16)	OCC	48.91	141.48
Sus. + W4{1}	21404	1416		3.24	(16)	OCC	48.91	141.48
All N- Max P{1}					( 3)	HOOP	84.24	117.90
GR + Max P{1}	21404			1.00	(15)	SUST	36.77	117.90
TR:Amb to T1{1}			39715	1.00	(17)	DISP	14.18	176.85
Amb to T1{1}			39715	1.00	(17)	DISP	14.18	176.85
Sus. + E1{1}	21404	2930		1.00	(16)	OCC	37.82	141.48
Sus. + E2{1}	21404	2930		1.00	(16)	OCC	37.82	141.48
Sus. + E3{1}	21404	2649		1.00	(16)	OCC	37.72	141.48
Sus. + E4{1}	21404	2649		1.00	(16)	OCC	37.72	141.48
Sus. + W1{1}	21404	2107		1.00	(16)	OCC	37.52	141.48
Sus. + W2{1}	21404	2107		1.00	(16)	OCC	37.52	141.48
Sus. + W3{1}	21404	1416		1.00	(16)	OCC	37.28	141.48
Sus. + W4{1}	21404	1416		1.00	(16)	OCC	37.28	141.48
A09 F+ Max P{1}					( 3)	HOOP	84.24	117.90
GR + Max P{1}	67066			1.00	(15)	SUST	53.07	117.90
TR:Amb to T1{1}			76293	1.00	(17)	DISP	27.23	176.85
Amb to T1{1}			76293	1.00	(17)	DISP	27.23	176.85
Sus. + E1{1}	67066	4699		1.00	(16)	OCC	54.75	141.48
Sus. + E2{1}	67066	4699		1.00	(16)	OCC	54.75	141.48
Sus. + E3{1}	67066	6039		1.00	(16)	OCC	55.23	141.48
Sus. + E4{1}	67066	6039		1.00	(16)	OCC	55.23	141.48
Sus. + W1{1}	67066	1963		1.00	(16)	OCC	53.77	141.48
Sus. + W2{1}	67066	1963		1.00	(16)	OCC	53.77	141.48
Sus. + W3{1}	67066	1421		1.00	(16)	OCC	53.58	141.48
Sus. + W4{1}	67066	1421		1.00	(16)	OCC	53.58	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
			(Moments in N.m )			(Stress in N/mm2 )			
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Code type	Code Stress	Code Allow.
A09 N-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	36738			1.00	(15)	SUST	42.25	117.90
	TR:Amb to T1{1}			74085	1.00	(17)	DISP	26.45	176.85
	Amb to T1{1}			74085	1.00	(17)	DISP	26.45	176.85
	Sus. + E1{1}	36738	6138		1.00	(16)	OCC	44.44	141.48
	Sus. + E2{1}	36738	6138		1.00	(16)	OCC	44.44	141.48
	Sus. + E3{1}	36738	6912		1.00	(16)	OCC	44.71	141.48
	Sus. + E4{1}	36738	6912		1.00	(16)	OCC	44.71	141.48
	Sus. + W1{1}	36738	1608		1.00	(16)	OCC	42.82	141.48
	Sus. + W2{1}	36738	1608		1.00	(16)	OCC	42.82	141.48
	Sus. + W3{1}	36738	1802		1.00	(16)	OCC	42.89	141.48
	Sus. + W4{1}	36738	1802		1.00	(16)	OCC	42.89	141.48
A08 +	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	30428			1.00	(15)	SUST	39.99	117.90
	TR:Amb to T1{1}			154070	1.00	(17)	DISP	55.00	176.85
	Amb to T1{1}			154070	1.00	(17)	DISP	55.00	176.85
	Sus. + E1{1}	30428	57177		1.00	(16)	OCC	60.40	141.48
	Sus. + E2{1}	30428	57177		1.00	(16)	OCC	60.40	141.48
	Sus. + E3{1}	30428	41081		1.00	(16)	OCC	54.66	141.48
	Sus. + E4{1}	30428	41081		1.00	(16)	OCC	54.66	141.48
	Sus. + W1{1}	30428	24910		1.00	(16)	OCC	48.89	141.48
	Sus. + W2{1}	30428	24910		1.00	(16)	OCC	48.89	141.48
	Sus. + W3{1}	30428	13194		1.00	(16)	OCC	44.70	141.48
	Sus. + W4{1}	30428	13194		1.00	(16)	OCC	44.70	141.48
A08 -	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	30428			1.00	(15)	SUST	39.99	117.90
	TR:Amb to T1{1}			154070	1.00	(17)	DISP	55.00	176.85
	Amb to T1{1}			154070	1.00	(17)	DISP	55.00	176.85
	Sus. + E1{1}	30428	57177		1.00	(16)	OCC	60.40	141.48
	Sus. + E2{1}	30428	57177		1.00	(16)	OCC	60.40	141.48

Sus. + E3{1}	30428	41081	1.00	(16)	OCC	54.66	141.48
Sus. + E4{1}	30428	41081	1.00	(16)	OCC	54.66	141.48
Sus. + W1{1}	30428	24910	1.00	(16)	OCC	48.89	141.48
Sus. + W2{1}	30428	24910	1.00	(16)	OCC	48.89	141.48
Sus. + W3{1}	30428	13194	1.00	(16)	OCC	44.70	141.48
Sus. + W4{1}	30428	13194	1.00	(16)	OCC	44.70	141.48

A07 F+ Max P{1}				( 3)	HOOP	84.24	117.90
GR + Max P{1}	46586		1.00	(15)	SUST	45.76	117.90
TR:Amb to T1{1}			15718	1.00	(17)	DISP	5.61 176.85
Amb to T1{1}			15718	1.00	(17)	DISP	5.61 176.85
Sus. + E1{1}	46586	4006	1.00	(16)	OCC	47.19	141.48
Sus. + E2{1}	46586	4006	1.00	(16)	OCC	47.19	141.48
Sus. + E3{1}	46586	9900	1.00	(16)	OCC	49.30	141.48
Sus. + E4{1}	46586	9900	1.00	(16)	OCC	49.30	141.48
Sus. + W1{1}	46586	2366	1.00	(16)	OCC	46.61	141.48
Sus. + W2{1}	46586	2366	1.00	(16)	OCC	46.61	141.48
Sus. + W3{1}	46586	2530	1.00	(16)	OCC	46.66	141.48
Sus. + W4{1}	46586	2530	1.00	(16)	OCC	46.66	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Moments in N.m )		(Stress in N/mm2 )		Eq. Load no.	Code type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F						
A07 N- Max P{1}								( 3)	HOOP	84.24	117.90
GR + Max P{1}		44673				1.00		(15)	SUST	45.08	117.90
TR:Amb to T1{1}				12817		1.00		(17)	DISP	4.58	176.85
Amb to T1{1}				12817		1.00		(17)	DISP	4.58	176.85
Sus. + E1{1}		44673	4886			1.00		(16)	OCC	46.82	141.48
Sus. + E2{1}		44673	4886			1.00		(16)	OCC	46.82	141.48
Sus. + E3{1}		44673	10294			1.00		(16)	OCC	48.75	141.48
Sus. + E4{1}		44673	10294			1.00		(16)	OCC	48.75	141.48
Sus. + W1{1}		44673	1681			1.00		(16)	OCC	45.68	141.48
Sus. + W2{1}		44673	1681			1.00		(16)	OCC	45.68	141.48
Sus. + W3{1}		44673	2702			1.00		(16)	OCC	46.04	141.48
Sus. + W4{1}		44673	2702			1.00		(16)	OCC	46.04	141.48
A06 F+ Max P{1}								( 3)	HOOP	84.24	117.90
GR + Max P{1}		36630				1.00		(15)	SUST	42.21	117.90
TR:Amb to T1{1}				48295		1.00		(17)	DISP	17.24	176.85
Amb to T1{1}				48295		1.00		(17)	DISP	17.24	176.85
Sus. + E1{1}		36630	13913			1.00		(16)	OCC	47.17	141.48
Sus. + E2{1}		36630	13913			1.00		(16)	OCC	47.17	141.48
Sus. + E3{1}		36630	11288			1.00		(16)	OCC	46.24	141.48
Sus. + E4{1}		36630	11288			1.00		(16)	OCC	46.24	141.48
Sus. + W1{1}		36630	4126			1.00		(16)	OCC	43.68	141.48
Sus. + W2{1}		36630	4126			1.00		(16)	OCC	43.68	141.48
Sus. + W3{1}		36630	3362			1.00		(16)	OCC	43.41	141.48
Sus. + W4{1}		36630	3362			1.00		(16)	OCC	43.41	141.48
A06 N- Max P{1}								( 3)	HOOP	84.24	117.90
GR + Max P{1}		36449				1.00		(15)	SUST	42.14	117.90
TR:Amb to T1{1}				50862		1.00		(17)	DISP	18.16	176.85
Amb to T1{1}				50862		1.00		(17)	DISP	18.16	176.85
Sus. + E1{1}		36449	14275			1.00		(16)	OCC	47.24	141.48
Sus. + E2{1}		36449	14275			1.00		(16)	OCC	47.24	141.48
Sus. + E3{1}		36449	11080			1.00		(16)	OCC	46.10	141.48
Sus. + E4{1}		36449	11080			1.00		(16)	OCC	46.10	141.48
Sus. + W1{1}		36449	4278			1.00		(16)	OCC	43.67	141.48
Sus. + W2{1}		36449	4278			1.00		(16)	OCC	43.67	141.48
Sus. + W3{1}		36449	3286			1.00		(16)	OCC	43.32	141.48
Sus. + W4{1}		36449	3286			1.00		(16)	OCC	43.32	141.48
A05 F+ Max P{1}								( 3)	HOOP	84.24	117.90
GR + Max P{1}		21290				1.00		(15)	SUST	36.73	117.90
TR:Amb to T1{1}				93683		1.00		(17)	DISP	33.44	176.85
Amb to T1{1}				93683		1.00		(17)	DISP	33.44	176.85
Sus. + E1{1}		21290	17103			1.00		(16)	OCC	42.84	141.48
Sus. + E2{1}		21290	17103			1.00		(16)	OCC	42.84	141.48
Sus. + E3{1}		21290	7581			1.00		(16)	OCC	39.44	141.48
Sus. + E4{1}		21290	7581			1.00		(16)	OCC	39.44	141.48
Sus. + W1{1}		21290	4918			1.00		(16)	OCC	38.49	141.48
Sus. + W2{1}		21290	4918			1.00		(16)	OCC	38.49	141.48

Sus. + W3{1}	21290	1593	1.00	(16)	OCC	37.30	141.48
Sus. + W4{1}	21290	1593	1.00	(16)	OCC	37.30	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )	Ma (Sus.)	Mb (Occ.)			
A05 N-	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	21745			1.00	(15) SUST	36.89	117.90
	TR:Amb to T1{1}			97535	1.00	(17) DISP	34.82	176.85
	Amb to T1{1}			97535	1.00	(17) DISP	34.82	176.85
	Sus. + E1{1}	21745	13788		1.00	(16) OCC	41.82	141.48
	Sus. + E2{1}	21745	13788		1.00	(16) OCC	41.82	141.48
	Sus. + E3{1}	21745	9138		1.00	(16) OCC	40.16	141.48
	Sus. + E4{1}	21745	9138		1.00	(16) OCC	40.16	141.48
	Sus. + W1{1}	21745	3673		1.00	(16) OCC	38.21	141.48
	Sus. + W2{1}	21745	3673		1.00	(16) OCC	38.21	141.48
	Sus. + W3{1}	21745	2371		1.00	(16) OCC	37.74	141.48
	Sus. + W4{1}	21745	2371		1.00	(16) OCC	37.74	141.48
A04 F+	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	20015			1.00	(15) SUST	36.28	117.90
	TR:Amb to T1{1}			80322	1.00	(17) DISP	28.67	176.85
	Amb to T1{1}			80322	1.00	(17) DISP	28.67	176.85
	Sus. + E1{1}	20015	11317		1.00	(16) OCC	40.32	141.48
	Sus. + E2{1}	20015	11317		1.00	(16) OCC	40.32	141.48
	Sus. + E3{1}	20015	11620		1.00	(16) OCC	40.42	141.48
	Sus. + E4{1}	20015	11620		1.00	(16) OCC	40.42	141.48
	Sus. + W1{1}	20015	3044		1.00	(16) OCC	37.36	141.48
	Sus. + W2{1}	20015	3044		1.00	(16) OCC	37.36	141.48
	Sus. + W3{1}	20015	2822		1.00	(16) OCC	37.28	141.48
	Sus. + W4{1}	20015	2822		1.00	(16) OCC	37.28	141.48
A04 N+	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	20168			3.24	(15) SUST	46.61	117.90
	TR:Amb to T1{1}			55806	3.24	(17) DISP	64.50	176.85
	Amb to T1{1}			55806	3.24	(17) DISP	64.50	176.85
	Sus. + E1{1}	20168	17522		3.24	(16) OCC	61.80	141.48
	Sus. + E2{1}	20168	17522		3.24	(16) OCC	61.80	141.48
	Sus. + E3{1}	20168	9044		3.24	(16) OCC	54.45	141.48
	Sus. + E4{1}	20168	9044		3.24	(16) OCC	54.45	141.48
	Sus. + W1{1}	20168	5198		3.24	(16) OCC	51.12	141.48
	Sus. + W2{1}	20168	5198		3.24	(16) OCC	51.12	141.48
	Sus. + W3{1}	20168	2125		3.24	(16) OCC	48.46	141.48
	Sus. + W4{1}	20168	2125		3.24	(16) OCC	48.46	141.48
A04 N-	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	20168			1.00	(15) SUST	36.33	117.90
	TR:Amb to T1{1}			55806	1.00	(17) DISP	19.92	176.85
	Amb to T1{1}			55806	1.00	(17) DISP	19.92	176.85
	Sus. + E1{1}	20168	17522		1.00	(16) OCC	42.59	141.48
	Sus. + E2{1}	20168	17522		1.00	(16) OCC	42.59	141.48
	Sus. + E3{1}	20168	9044		1.00	(16) OCC	39.56	141.48
	Sus. + E4{1}	20168	9044		1.00	(16) OCC	39.56	141.48
	Sus. + W1{1}	20168	5198		1.00	(16) OCC	38.19	141.48
	Sus. + W2{1}	20168	5198		1.00	(16) OCC	38.19	141.48
	Sus. + W3{1}	20168	2125		1.00	(16) OCC	37.09	141.48
	Sus. + W4{1}	20168	2125		1.00	(16) OCC	37.09	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )	Ma (Sus.)	Mb (Occ.)			

-----									
A03	+	Max P{1}				( 3)	HOOP	84.24	117.90
		GR + Max P{1}	52831			1.00	(15) SUST	47.99	117.90
		TR:Amb to T1{1}			45856	1.00	(17) DISP	16.37	176.85
		Amb to T1{1}			45856	1.00	(17) DISP	16.37	176.85
		Sus. + E1{1}	52831	23495		1.00	(16) OCC	56.38	141.48
		Sus. + E2{1}	52831	23495		1.00	(16) OCC	56.38	141.48
		Sus. + E3{1}	52831	27160		1.00	(16) OCC	57.69	141.48
		Sus. + E4{1}	52831	27160		1.00	(16) OCC	57.69	141.48
		Sus. + W1{1}	52831	6122		1.00	(16) OCC	50.18	141.48
		Sus. + W2{1}	52831	6122		1.00	(16) OCC	50.18	141.48
		Sus. + W3{1}	52831	6866		1.00	(16) OCC	50.44	141.48
		Sus. + W4{1}	52831	6866		1.00	(16) OCC	50.44	141.48
A03	-	Max P{1}				( 3)	HOOP	84.24	117.90
		GR + Max P{1}	52831			1.00	(15) SUST	47.99	117.90
		TR:Amb to T1{1}			45856	1.00	(17) DISP	16.37	176.85
		Amb to T1{1}			45856	1.00	(17) DISP	16.37	176.85
		Sus. + E1{1}	52831	23495		1.00	(16) OCC	56.38	141.48
		Sus. + E2{1}	52831	23495		1.00	(16) OCC	56.38	141.48
		Sus. + E3{1}	52831	27160		1.00	(16) OCC	57.69	141.48
		Sus. + E4{1}	52831	27160		1.00	(16) OCC	57.69	141.48
		Sus. + W1{1}	52831	6122		1.00	(16) OCC	50.18	141.48
		Sus. + W2{1}	52831	6122		1.00	(16) OCC	50.18	141.48
		Sus. + W3{1}	52831	6866		1.00	(16) OCC	50.44	141.48
		Sus. + W4{1}	52831	6866		1.00	(16) OCC	50.44	141.48
A02	F+	Max P{1}				( 3)	HOOP	84.24	117.90
		GR + Max P{1}	30892			1.00	(15) SUST	40.16	117.90
		TR:Amb to T1{1}			59564	1.00	(17) DISP	21.26	176.85
		Amb to T1{1}			59564	1.00	(17) DISP	21.26	176.85
		Sus. + E1{1}	30892	24521		1.00	(16) OCC	48.91	141.48
		Sus. + E2{1}	30892	24521		1.00	(16) OCC	48.91	141.48
		Sus. + E3{1}	30892	18141		1.00	(16) OCC	46.64	141.48
		Sus. + E4{1}	30892	18141		1.00	(16) OCC	46.64	141.48
		Sus. + W1{1}	30892	6041		1.00	(16) OCC	42.32	141.48
		Sus. + W2{1}	30892	6041		1.00	(16) OCC	42.32	141.48
		Sus. + W3{1}	30892	4230		1.00	(16) OCC	41.67	141.48
		Sus. + W4{1}	30892	4230		1.00	(16) OCC	41.67	141.48
A02	F-	Max P{1}				( 3)	HOOP	84.24	117.90
		GR + Max P{1}	30892			3.24	(15) SUST	55.91	117.90
		TR:Amb to T1{1}			59564	3.24	(17) DISP	68.84	176.85
		Amb to T1{1}			59564	3.24	(17) DISP	68.84	176.85
		Sus. + E1{1}	30892	24521		3.24	(16) OCC	77.17	141.48
		Sus. + E2{1}	30892	24521		3.24	(16) OCC	77.17	141.48
		Sus. + E3{1}	30892	18141		3.24	(16) OCC	71.64	141.48
		Sus. + E4{1}	30892	18141		3.24	(16) OCC	71.64	141.48
		Sus. + W1{1}	30892	6041		3.24	(16) OCC	61.15	141.48
		Sus. + W2{1}	30892	6041		3.24	(16) OCC	61.15	141.48
		Sus. + W3{1}	30892	4230		3.24	(16) OCC	59.58	141.48
		Sus. + W4{1}	30892	4230		3.24	(16) OCC	59.58	141.48
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ASME B31.1 (2014) CODE COMPLIANCE									
		(Moments in N.m )			(Stress in N/mm2 )				
Point	Load	Ma	Mb	Mc	Eq. Load	Code	Code		
name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no.	type	Stress	Allow.
-----									
A02	N+	Max P{1}				( 3)	HOOP	84.24	117.90
		GR + Max P{1}	14869			3.24	(15) SUST	42.02	117.90
		TR:Amb to T1{1}			66643	3.24	(17) DISP	77.02	176.85
		Amb to T1{1}			66643	3.24	(17) DISP	77.02	176.85
		Sus. + E1{1}	14869	13043		3.24	(16) OCC	53.33	141.48
		Sus. + E2{1}	14869	13043		3.24	(16) OCC	53.33	141.48
		Sus. + E3{1}	14869	10940		3.24	(16) OCC	51.50	141.48
		Sus. + E4{1}	14869	10940		3.24	(16) OCC	51.50	141.48
		Sus. + W1{1}	14869	3045		3.24	(16) OCC	44.66	141.48
		Sus. + W2{1}	14869	3045		3.24	(16) OCC	44.66	141.48
		Sus. + W3{1}	14869	2317		3.24	(16) OCC	44.03	141.48
		Sus. + W4{1}	14869	2317		3.24	(16) OCC	44.03	141.48
A02	N-	Max P{1}				( 3)	HOOP	84.24	117.90
		GR + Max P{1}	14869			1.00	(15) SUST	34.44	117.90
		TR:Amb to T1{1}			66643	1.00	(17) DISP	23.79	176.85



	Amb to T1{1}			66643	1.00	(17)	DISP	23.79	176.85
	Sus. + E1{1}	14869	13043		1.00	(16)	OCC	39.10	141.48
	Sus. + E2{1}	14869	13043		1.00	(16)	OCC	39.10	141.48
	Sus. + E3{1}	14869	10940		1.00	(16)	OCC	38.34	141.48
	Sus. + E4{1}	14869	10940		1.00	(16)	OCC	38.34	141.48
	Sus. + W1{1}	14869	3045		1.00	(16)	OCC	35.53	141.48
	Sus. + W2{1}	14869	3045		1.00	(16)	OCC	35.53	141.48
	Sus. + W3{1}	14869	2317		1.00	(16)	OCC	35.27	141.48
	Sus. + W4{1}	14869	2317		1.00	(16)	OCC	35.27	141.48
A01	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	12668			1.00	(15)	SUST	33.65	117.90
	TR:Amb to T1{1}			65144	1.00	(17)	DISP	23.25	176.85
	Amb to T1{1}			65144	1.00	(17)	DISP	23.25	176.85
	Sus. + E1{1}	12668	5308		1.00	(16)	OCC	35.55	141.48
	Sus. + E2{1}	12668	5308		1.00	(16)	OCC	35.55	141.48
	Sus. + E3{1}	12668	10384		1.00	(16)	OCC	37.36	141.48
	Sus. + E4{1}	12668	10384		1.00	(16)	OCC	37.36	141.48
	Sus. + W1{1}	12668	888		1.00	(16)	OCC	33.97	141.48
	Sus. + W2{1}	12668	888		1.00	(16)	OCC	33.97	141.48
	Sus. + W3{1}	12668	2189		1.00	(16)	OCC	34.44	141.48
	Sus. + W4{1}	12668	2189		1.00	(16)	OCC	34.44	141.48

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#### R E S U L T S U M M A R Y

##### Maximum sustained stress ratio

Point : A07 F  
 Stress N/mm2 : 114.57  
 Allowable N/mm2 : 117.90  
 Ratio : 0.97  
 Load combination : GR + Max P{1}

##### Maximum displacement stress ratio

Point : A06 N  
 Stress N/mm2 : 124.37  
 Allowable N/mm2 : 176.85  
 Ratio : 0.70  
 Load combination : Max Range

##### Maximum occasional stress ratio

Point : A07 F  
 Stress N/mm2 : 132.73  
 Allowable N/mm2 : 141.48  
 Ratio : 0.94  
 Load combination : Sus. + E3{1}

##### Maximum hoop stress ratio

Point : A07 F  
 Stress N/mm2 : 84.24  
 Allowable N/mm2 : 117.90  
 Ratio : 0.71  
 Load combination : Max P{1}

## **LAMPIRAN F**

*GENERAL PIPE STRESS REPORT (HYDROTEST CONDITION  
WITHOUT EXPANSION JOINT, PIPE THICKNESS = 8,501 mm)*

Hydrotest Condition without Expansion  
 01/08/2018 BLOWDOWN TANK VENT STRESS ANALYSIS  
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 AutoPIPE Standard 10.01.00.08

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A02 N+	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	19446			3.24	(15) SUST	45.99	117.90
	TR:Amb to T1{1}			193260	3.24	(17) DISP	223.37	176.85**
	with Sus. load margin						223.37	248.76
	Amb to T1{1}			193260	3.24	(17) DISP	223.37	176.85**
	with Sus. load margin						223.37	248.76
	Sus. + E1{1}	19446	8875		3.24	(16) OCC	53.68	141.48
	Sus. + E2{1}	19446	8875		3.24	(16) OCC	53.68	141.48
	Sus. + E3{1}	19446	10978		3.24	(16) OCC	55.50	141.48
	Sus. + E4{1}	19446	10978		3.24	(16) OCC	55.50	141.48
	Sus. + W1{1}	19446	2494		3.24	(16) OCC	48.15	141.48
	Sus. + W2{1}	19446	2494		3.24	(16) OCC	48.15	141.48
	Sus. + W3{1}	19446	2661		3.24	(16) OCC	48.29	141.48
	Sus. + W4{1}	19446	2661		3.24	(16) OCC	48.29	141.48
A02 F-	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	27725			3.24	(15) SUST	53.16	117.90
	TR:Amb to T1{1}			184327	3.24	(17) DISP	213.04	176.85**
	with Sus. load margin						213.04	241.59
	Amb to T1{1}			184327	3.24	(17) DISP	213.04	176.85**
	with Sus. load margin						213.04	241.59
	Sus. + E1{1}	27725	7000		3.24	(16) OCC	59.23	141.48
	Sus. + E2{1}	27725	7000		3.24	(16) OCC	59.23	141.48
	Sus. + E3{1}	27725	11453		3.24	(16) OCC	63.09	141.48
	Sus. + E4{1}	27725	11453		3.24	(16) OCC	63.09	141.48
	Sus. + W1{1}	27725	2223		3.24	(16) OCC	55.09	141.48
	Sus. + W2{1}	27725	2223		3.24	(16) OCC	55.09	141.48
	Sus. + W3{1}	27725	2827		3.24	(16) OCC	55.62	141.48
	Sus. + W4{1}	27725	2827		3.24	(16) OCC	55.62	141.48
A04 N+	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	26395			3.24	(15) SUST	52.01	117.90
	TR:Amb to T1{1}			144011	3.24	(17) DISP	166.44	176.85
	Amb to T1{1}			144011	3.24	(17) DISP	166.44	176.85
	Sus. + E1{1}	26395	15818		3.24	(16) OCC	65.72	141.48
	Sus. + E2{1}	26395	15818		3.24	(16) OCC	65.72	141.48
	Sus. + E3{1}	26395	7115		3.24	(16) OCC	58.18	141.48
	Sus. + E4{1}	26395	7115		3.24	(16) OCC	58.18	141.48
	Sus. + W1{1}	26395	5496		3.24	(16) OCC	56.78	141.48
	Sus. + W2{1}	26395	5496		3.24	(16) OCC	56.78	141.48
	Sus. + W3{1}	26395	1629		3.24	(16) OCC	53.42	141.48
	Sus. + W4{1}	26395	1629		3.24	(16) OCC	53.42	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A05 F-	Max P{1}					( 3) HOOP	84.24	117.90
	GR + Max P{1}	12181			3.24	(15) SUST	39.69	117.90
	TR:Amb to T1{1}			135391	3.24	(17) DISP	156.48	176.85
	Amb to T1{1}			135391	3.24	(17) DISP	156.48	176.85
	Sus. + E1{1}	12181	10882		3.24	(16) OCC	49.12	141.48
	Sus. + E2{1}	12181	10882		3.24	(16) OCC	49.12	141.48
	Sus. + E3{1}	12181	2815		3.24	(16) OCC	42.13	141.48
	Sus. + E4{1}	12181	2815		3.24	(16) OCC	42.13	141.48
	Sus. + W1{1}	12181	3833		3.24	(16) OCC	43.01	141.48
	Sus. + W2{1}	12181	3833		3.24	(16) OCC	43.01	141.48

	Sus. + W3{1}	12181	787		3.24	(16)	OCC	40.37	141.48
	Sus. + W4{1}	12181	787		3.24	(16)	OCC	40.37	141.48
A05 N+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	8960			3.24	(15)	SUST	36.90	117.90
	TR:Amb to T1{1}			115991	3.24	(17)	DISP	134.06	176.85
	Amb to T1{1}			115991	3.24	(17)	DISP	134.06	176.85
	Sus. + E1{1}	8960	6912		3.24	(16)	OCC	42.89	141.48
	Sus. + E2{1}	8960	6912		3.24	(16)	OCC	42.89	141.48
	Sus. + E3{1}	8960	6226		3.24	(16)	OCC	42.30	141.48
	Sus. + E4{1}	8960	6226		3.24	(16)	OCC	42.30	141.48
	Sus. + W1{1}	8960	2359		3.24	(16)	OCC	38.94	141.48
	Sus. + W2{1}	8960	2359		3.24	(16)	OCC	38.94	141.48
	Sus. + W3{1}	8960	2101		3.24	(16)	OCC	38.72	141.48
	Sus. + W4{1}	8960	2101		3.24	(16)	OCC	38.72	141.48
A06 F-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	36345			6.85	(15)	SUST	95.79	117.90
	TR:Amb to T1{1}			50046	6.85	(17)	DISP	122.38	176.85
	Amb to T1{1}			50046	6.85	(17)	DISP	122.38	176.85
	Sus. + E1{1}	36345	12113		6.85	(16)	OCC	118.01	141.48
	Sus. + E2{1}	36345	12113		6.85	(16)	OCC	118.01	141.48
	Sus. + E3{1}	36345	10122		6.85	(16)	OCC	114.35	141.48
	Sus. + E4{1}	36345	10122		6.85	(16)	OCC	114.35	141.48
	Sus. + W1{1}	36345	4031		6.85	(16)	OCC	103.18	141.48
	Sus. + W2{1}	36345	4031		6.85	(16)	OCC	103.18	141.48
	Sus. + W3{1}	36345	3390		6.85	(16)	OCC	102.01	141.48
	Sus. + W4{1}	36345	3390		6.85	(16)	OCC	102.01	141.48
A06 N+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	36166			6.85	(15)	SUST	95.46	117.90
	TR:Amb to T1{1}			50034	6.85	(17)	DISP	122.35	176.85
	Amb to T1{1}			50034	6.85	(17)	DISP	122.35	176.85
	Sus. + E1{1}	36166	12131		6.85	(16)	OCC	117.71	141.48
	Sus. + E2{1}	36166	12131		6.85	(16)	OCC	117.71	141.48
	Sus. + E3{1}	36166	9725		6.85	(16)	OCC	113.30	141.48
	Sus. + E4{1}	36166	9725		6.85	(16)	OCC	113.30	141.48
	Sus. + W1{1}	36166	4103		6.85	(16)	OCC	102.99	141.48
	Sus. + W2{1}	36166	4103		6.85	(16)	OCC	102.99	141.48
	Sus. + W3{1}	36166	3274		6.85	(16)	OCC	101.47	141.48
	Sus. + W4{1}	36166	3274		6.85	(16)	OCC	101.47	141.48

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ASME B31.1 (2014) CODE COMPLIANCE										
Point name	Load combination	(Moments in N.m )		(Stress in N/mm2 )			Code	Code	Stress	Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type				
A09 N+	Max P{1}					( 3)	HOOP	84.24	117.90	
	GR + Max P{1}	34403			3.24	(15)	SUST	58.95	117.90	
	TR:Amb to T1{1}			92721	3.24	(17)	DISP	107.16	176.85	
	Amb to T1{1}			92721	3.24	(17)	DISP	107.16	176.85	
	Sus. + E1{1}	34403	3973		3.24	(16)	OCC	62.40	141.48	
	Sus. + E2{1}	34403	3973		3.24	(16)	OCC	62.40	141.48	
	Sus. + E3{1}	34403	2677		3.24	(16)	OCC	61.27	141.48	
	Sus. + E4{1}	34403	2677		3.24	(16)	OCC	61.27	141.48	
	Sus. + W1{1}	34403	855		3.24	(16)	OCC	59.70	141.48	
	Sus. + W2{1}	34403	855		3.24	(16)	OCC	59.70	141.48	
	Sus. + W3{1}	34403	945		3.24	(16)	OCC	59.77	141.48	
	Sus. + W4{1}	34403	945		3.24	(16)	OCC	59.77	141.48	
A07 F-	Max P{1}					( 3)	HOOP	84.24	117.90	
	GR + Max P{1}	33773			6.85	(15)	SUST	91.07	117.90	
	TR:Amb to T1{1}			34687	6.85	(17)	DISP	84.82	176.85	
	Amb to T1{1}			34687	6.85	(17)	DISP	84.82	176.85	
	Sus. + E1{1}	33773	3941		6.85	(16)	OCC	98.30	141.48	
	Sus. + E2{1}	33773	3941		6.85	(16)	OCC	98.30	141.48	
	Sus. + E3{1}	33773	6265		6.85	(16)	OCC	102.56	141.48	
	Sus. + E4{1}	33773	6265		6.85	(16)	OCC	102.56	141.48	
	Sus. + W1{1}	33773	2289		6.85	(16)	OCC	95.27	141.48	
	Sus. + W2{1}	33773	2289		6.85	(16)	OCC	95.27	141.48	
	Sus. + W3{1}	33773	1908		6.85	(16)	OCC	94.57	141.48	
	Sus. + W4{1}	33773	1908		6.85	(16)	OCC	94.57	141.48	
A07 N+	Max P{1}					( 3)	HOOP	84.24	117.90	

GR + Max P{1}	31673			6.85	(15)	SUST	87.22	117.90		
TR:Amb to T1{1}				6.85	(17)	DISP	92.07	176.85		
Amb to T1{1}				37650						
				37650						
Sus. + E1{1}	31673	3832		6.85	(16)	OCC	94.25	141.48		
Sus. + E2{1}	31673	3832		6.85	(16)	OCC	94.25	141.48		
Sus. + E3{1}	31673	7045		6.85	(16)	OCC	100.14	141.48		
Sus. + E4{1}	31673	7045		6.85	(16)	OCC	100.14	141.48		
Sus. + W1{1}	31673	1656		6.85	(16)	OCC	90.26	141.48		
Sus. + W2{1}	31673	1656		6.85	(16)	OCC	90.26	141.48		
Sus. + W3{1}	31673	2149		6.85	(16)	OCC	91.16	141.48		
Sus. + W4{1}	31673	2149		6.85	(16)	OCC	91.16	141.48		
A03 + Max P{1}							( 3)	HOOP	84.24	117.90
GR + Max P{1}	70686			1.00	(15)	SUST	54.36	117.90		
TR:Amb to T1{1}				276104						
Amb to T1{1}				276104						
Sus. + E1{1}	70686	14188		1.00	(16)	OCC	59.43	141.48		
Sus. + E2{1}	70686	14188		1.00	(16)	OCC	59.43	141.48		
Sus. + E3{1}	70686	33577		1.00	(16)	OCC	66.35	141.48		
Sus. + E4{1}	70686	33577		1.00	(16)	OCC	66.35	141.48		
Sus. + W1{1}	70686	4998		1.00	(16)	OCC	56.15	141.48		
Sus. + W2{1}	70686	4998		1.00	(16)	OCC	56.15	141.48		
Sus. + W3{1}	70686	8535		1.00	(16)	OCC	57.41	141.48		
Sus. + W4{1}	70686	8535		1.00	(16)	OCC	57.41	141.48		

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ASME B31.1 (2014) CODE COMPLIANCE										
		(Moments in N.m )			(Stress in N/mm2 )					
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.		
A03	- Max P{1}					( 3) HOOP	84.24	117.90		
	GR + Max P{1}	70686			1.00	(15) SUST	54.36	117.90		
	TR:Amb to T1{1}			276104	1.00	(17) DISP	98.56	176.85		
	Amb to T1{1}			276104	1.00	(17) DISP	98.56	176.85		
	Sus. + E1{1}	70686	14188		1.00	(16) OCC	59.43	141.48		
	Sus. + E2{1}	70686	14188		1.00	(16) OCC	59.43	141.48		
	Sus. + E3{1}	70686	33577		1.00	(16) OCC	66.35	141.48		
	Sus. + E4{1}	70686	33577		1.00	(16) OCC	66.35	141.48		
	Sus. + W1{1}	70686	4998		1.00	(16) OCC	56.15	141.48		
	Sus. + W2{1}	70686	4998		1.00	(16) OCC	56.15	141.48		
	Sus. + W3{1}	70686	8535		1.00	(16) OCC	57.41	141.48		
	Sus. + W4{1}	70686	8535		1.00	(16) OCC	57.41	141.48		
A08 + Max P{1}							( 3)	HOOP	84.24	117.90
	GR + Max P{1}	26197			1.00	(15) SUST	38.48	117.90		
	TR:Amb to T1{1}			267142	1.00	(17) DISP	95.36	176.85		
	Amb to T1{1}			267142	1.00	(17) DISP	95.36	176.85		
	Sus. + E1{1}	26197	51263		1.00	(16) OCC	56.78	141.48		
	Sus. + E2{1}	26197	51263		1.00	(16) OCC	56.78	141.48		
	Sus. + E3{1}	26197	32775		1.00	(16) OCC	50.18	141.48		
	Sus. + E4{1}	26197	32775		1.00	(16) OCC	50.18	141.48		
	Sus. + W1{1}	26197	22845		1.00	(16) OCC	46.64	141.48		
	Sus. + W2{1}	26197	22845		1.00	(16) OCC	46.64	141.48		
	Sus. + W3{1}	26197	11057		1.00	(16) OCC	42.43	141.48		
	Sus. + W4{1}	26197	11057		1.00	(16) OCC	42.43	141.48		
A08 - Max P{1}							( 3)	HOOP	84.24	117.90
	GR + Max P{1}	26197			1.00	(15) SUST	38.48	117.90		
	TR:Amb to T1{1}			267142	1.00	(17) DISP	95.36	176.85		
	Amb to T1{1}			267142	1.00	(17) DISP	95.36	176.85		
	Sus. + E1{1}	26197	51263		1.00	(16) OCC	56.78	141.48		
	Sus. + E2{1}	26197	51263		1.00	(16) OCC	56.78	141.48		
	Sus. + E3{1}	26197	32775		1.00	(16) OCC	50.18	141.48		
	Sus. + E4{1}	26197	32775		1.00	(16) OCC	50.18	141.48		
	Sus. + W1{1}	26197	22845		1.00	(16) OCC	46.64	141.48		
	Sus. + W2{1}	26197	22845		1.00	(16) OCC	46.64	141.48		
	Sus. + W3{1}	26197	11057		1.00	(16) OCC	42.43	141.48		
	Sus. + W4{1}	26197	11057		1.00	(16) OCC	42.43	141.48		
A10 + Max P{1}							( 3)	HOOP	84.24	117.90
	GR + Max P{1}	170963			1.00	(15) SUST	90.16	117.90		
	TR:Amb to T1{1}			18091	1.00	(17) DISP	6.46	176.85		
	Amb to T1{1}			18091	1.00	(17) DISP	6.46	176.85		
	Sus. + E1{1}	170963	1090		1.00	(16) OCC	90.55	141.48		

Sus. + E2{1}	170963	1090	1.00	(16)	OCC	90.55	141.48
Sus. + E3{1}	170963	2711	1.00	(16)	OCC	91.13	141.48
Sus. + E4{1}	170963	2711	1.00	(16)	OCC	91.13	141.48
Sus. + W1{1}	170963	1645	1.00	(16)	OCC	90.75	141.48
Sus. + W2{1}	170963	1645	1.00	(16)	OCC	90.75	141.48
Sus. + W3{1}	170963	915	1.00	(16)	OCC	90.49	141.48
Sus. + W4{1}	170963	915	1.00	(16)	OCC	90.49	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A10 -	Max P{1}				( 3)	HOOP	84.24	117.90
	GR + Max P{1}	170963			1.00	(15) SUST	90.16	117.90
	TR:Amb to Tl{1}			18091	1.00	(17) DISP	6.46	176.85
	Amb to Tl{1}			18091	1.00	(17) DISP	6.46	176.85
	Sus. + E1{1}	170963	1090		1.00	(16) OCC	90.55	141.48
	Sus. + E2{1}	170963	1090		1.00	(16) OCC	90.55	141.48
	Sus. + E3{1}	170963	2711		1.00	(16) OCC	91.13	141.48
	Sus. + E4{1}	170963	2711		1.00	(16) OCC	91.13	141.48
	Sus. + W1{1}	170963	1645		1.00	(16) OCC	90.75	141.48
	Sus. + W2{1}	170963	1645		1.00	(16) OCC	90.75	141.48
	Sus. + W3{1}	170963	915		1.00	(16) OCC	90.49	141.48
	Sus. + W4{1}	170963	915		1.00	(16) OCC	90.49	141.48
A04 F-	Max P{1}				( 3)	HOOP	84.24	117.90
	GR + Max P{1}	11401			3.24	(15) SUST	39.01	117.90
	TR:Amb to Tl{1}			78263	3.24	(17) DISP	90.45	176.85
	Amb to Tl{1}			78263	3.24	(17) DISP	90.45	176.85
	Sus. + E1{1}	11401	8799		3.24	(16) OCC	46.64	141.48
	Sus. + E2{1}	11401	8799		3.24	(16) OCC	46.64	141.48
	Sus. + E3{1}	11401	5889		3.24	(16) OCC	44.12	141.48
	Sus. + E4{1}	11401	5889		3.24	(16) OCC	44.12	141.48
	Sus. + W1{1}	11401	2984		3.24	(16) OCC	41.60	141.48
	Sus. + W2{1}	11401	2984		3.24	(16) OCC	41.60	141.48
	Sus. + W3{1}	11401	1573		3.24	(16) OCC	40.38	141.48
	Sus. + W4{1}	11401	1573		3.24	(16) OCC	40.38	141.48
A09 F-	Max P{1}				( 3)	HOOP	84.24	117.90
	GR + Max P{1}	61159			3.24	(15) SUST	82.15	117.90
	TR:Amb to Tl{1}			74596	3.24	(17) DISP	86.22	176.85
	Amb to Tl{1}			74596	3.24	(17) DISP	86.22	176.85
	Sus. + E1{1}	61159	1901		3.24	(16) OCC	83.79	141.48
	Sus. + E2{1}	61159	1901		3.24	(16) OCC	83.79	141.48
	Sus. + E3{1}	61159	2771		3.24	(16) OCC	84.55	141.48
	Sus. + E4{1}	61159	2771		3.24	(16) OCC	84.55	141.48
	Sus. + W1{1}	61159	1705		3.24	(16) OCC	83.62	141.48
	Sus. + W2{1}	61159	1705		3.24	(16) OCC	83.62	141.48
	Sus. + W3{1}	61159	814		3.24	(16) OCC	82.85	141.48
	Sus. + W4{1}	61159	814		3.24	(16) OCC	82.85	141.48
A15	Max P{1}				( 3)	HOOP	84.24	117.90
	GR + Max P{1}	8050			1.00	(15) SUST	32.01	117.90
	TR:Amb to Tl{1}			10470	1.00	(17) DISP	3.74	176.85
	Amb to Tl{1}			10470	1.00	(17) DISP	3.74	176.85
	Sus. + E1{1}	8050	31410		1.00	(16) OCC	43.22	141.48
	Sus. + E2{1}	8050	31410		1.00	(16) OCC	43.22	141.48
	Sus. + E3{1}	8050	30870		1.00	(16) OCC	43.03	141.48
	Sus. + E4{1}	8050	30870		1.00	(16) OCC	43.03	141.48
	Sus. + W1{1}	8050	17546		1.00	(16) OCC	38.27	141.48
	Sus. + W2{1}	8050	17546		1.00	(16) OCC	38.27	141.48
	Sus. + W3{1}	8050	13703		1.00	(16) OCC	36.90	141.48
	Sus. + W4{1}	8050	13703		1.00	(16) OCC	36.90	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Load type		
A14 F+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	12788			1.00	(15)	SUST	33.70	117.90
	TR:Amb to T1{1}			23268	1.00	(17)	DISP	8.31	176.85
	Amb to T1{1}			23268	1.00	(17)	DISP	8.31	176.85
	Sus. + E1{1}	12788	14076		1.00	(16)	OCC	38.72	141.48
	Sus. + E2{1}	12788	14076		1.00	(16)	OCC	38.72	141.48
	Sus. + E3{1}	12788	6978		1.00	(16)	OCC	36.19	141.48
	Sus. + E4{1}	12788	6978		1.00	(16)	OCC	36.19	141.48
	Sus. + W1{1}	12788	6952		1.00	(16)	OCC	36.18	141.48
	Sus. + W2{1}	12788	6952		1.00	(16)	OCC	36.18	141.48
	Sus. + W3{1}	12788	3292		1.00	(16)	OCC	34.87	141.48
	Sus. + W4{1}	12788	3292		1.00	(16)	OCC	34.87	141.48
A14 F-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	12788			3.24	(15)	SUST	40.22	117.90
	TR:Amb to T1{1}			23268	3.24	(17)	DISP	26.89	176.85
	Amb to T1{1}			23268	3.24	(17)	DISP	26.89	176.85
	Sus. + E1{1}	12788	14076		3.24	(16)	OCC	52.42	141.48
	Sus. + E2{1}	12788	14076		3.24	(16)	OCC	52.42	141.48
	Sus. + E3{1}	12788	6978		3.24	(16)	OCC	46.27	141.48
	Sus. + E4{1}	12788	6978		3.24	(16)	OCC	46.27	141.48
	Sus. + W1{1}	12788	6952		3.24	(16)	OCC	46.24	141.48
	Sus. + W2{1}	12788	6952		3.24	(16)	OCC	46.24	141.48
	Sus. + W3{1}	12788	3292		3.24	(16)	OCC	43.07	141.48
	Sus. + W4{1}	12788	3292		3.24	(16)	OCC	43.07	141.48
A14 N+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	5104			3.24	(15)	SUST	33.56	117.90
	TR:Amb to T1{1}			14336	3.24	(17)	DISP	16.57	176.85
	Amb to T1{1}			14336	3.24	(17)	DISP	16.57	176.85
	Sus. + E1{1}	5104	10576		3.24	(16)	OCC	42.72	141.48
	Sus. + E2{1}	5104	10576		3.24	(16)	OCC	42.72	141.48
	Sus. + E3{1}	5104	5824		3.24	(16)	OCC	38.60	141.48
	Sus. + E4{1}	5104	5824		3.24	(16)	OCC	38.60	141.48
	Sus. + W1{1}	5104	4830		3.24	(16)	OCC	37.74	141.48
	Sus. + W2{1}	5104	4830		3.24	(16)	OCC	37.74	141.48
	Sus. + W3{1}	5104	2855		3.24	(16)	OCC	36.03	141.48
	Sus. + W4{1}	5104	2855		3.24	(16)	OCC	36.03	141.48
A14 N-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	5104			1.00	(15)	SUST	30.95	117.90
	TR:Amb to T1{1}			14336	1.00	(17)	DISP	5.12	176.85
	Amb to T1{1}			14336	1.00	(17)	DISP	5.12	176.85
	Sus. + E1{1}	5104	10576		1.00	(16)	OCC	34.73	141.48
	Sus. + E2{1}	5104	10576		1.00	(16)	OCC	34.73	141.48
	Sus. + E3{1}	5104	5824		1.00	(16)	OCC	33.03	141.48
	Sus. + E4{1}	5104	5824		1.00	(16)	OCC	33.03	141.48
	Sus. + W1{1}	5104	4830		1.00	(16)	OCC	32.68	141.48
	Sus. + W2{1}	5104	4830		1.00	(16)	OCC	32.68	141.48
	Sus. + W3{1}	5104	2855		1.00	(16)	OCC	31.97	141.48
	Sus. + W4{1}	5104	2855		1.00	(16)	OCC	31.97	141.48

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Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Load type		
A13 F+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	14073			1.00	(15)	SUST	34.16	117.90
	TR:Amb to T1{1}			36251	1.00	(17)	DISP	12.94	176.85
	Amb to T1{1}			36251	1.00	(17)	DISP	12.94	176.85
	Sus. + E1{1}	14073	8130		1.00	(16)	OCC	37.06	141.48
	Sus. + E2{1}	14073	8130		1.00	(16)	OCC	37.06	141.48
	Sus. + E3{1}	14073	3710		1.00	(16)	OCC	35.48	141.48
	Sus. + E4{1}	14073	3710		1.00	(16)	OCC	35.48	141.48
	Sus. + W1{1}	14073	4640		1.00	(16)	OCC	35.81	141.48
	Sus. + W2{1}	14073	4640		1.00	(16)	OCC	35.81	141.48
	Sus. + W3{1}	14073	1658		1.00	(16)	OCC	34.75	141.48

	Sus. + W4{1}	14073	1658		1.00	(16)	OCC	34.75	141.48
A13 F-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	14073			3.24	(15)	SUST	41.33	117.90
	TR:Amb to T1{1}			36251	3.24	(17)	DISP	41.90	176.85
	Amb to T1{1}			36251	3.24	(17)	DISP	41.90	176.85
	Sus. + E1{1}	14073	8130		3.24	(16)	OCC	48.38	141.48
	Sus. + E2{1}	14073	8130		3.24	(16)	OCC	48.38	141.48
	Sus. + E3{1}	14073	3710		3.24	(16)	OCC	44.55	141.48
	Sus. + E4{1}	14073	3710		3.24	(16)	OCC	44.55	141.48
	Sus. + W1{1}	14073	4640		3.24	(16)	OCC	45.35	141.48
	Sus. + W2{1}	14073	4640		3.24	(16)	OCC	45.35	141.48
	Sus. + W3{1}	14073	1658		3.24	(16)	OCC	42.77	141.48
	Sus. + W4{1}	14073	1658		3.24	(16)	OCC	42.77	141.48
A13 N+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	6664			3.24	(15)	SUST	34.91	117.90
	TR:Amb to T1{1}			45192	3.24	(17)	DISP	52.23	176.85
	Amb to T1{1}			45192	3.24	(17)	DISP	52.23	176.85
	Sus. + E1{1}	6664	10595		3.24	(16)	OCC	44.09	141.48
	Sus. + E2{1}	6664	10595		3.24	(16)	OCC	44.09	141.48
	Sus. + E3{1}	6664	4591		3.24	(16)	OCC	38.89	141.48
	Sus. + E4{1}	6664	4591		3.24	(16)	OCC	38.89	141.48
	Sus. + W1{1}	6664	6171		3.24	(16)	OCC	40.26	141.48
	Sus. + W2{1}	6664	6171		3.24	(16)	OCC	40.26	141.48
	Sus. + W3{1}	6664	2282		3.24	(16)	OCC	36.89	141.48
	Sus. + W4{1}	6664	2282		3.24	(16)	OCC	36.89	141.48
A13 N-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	6664			1.00	(15)	SUST	31.51	117.90
	TR:Amb to T1{1}			45192	1.00	(17)	DISP	16.13	176.85
	Amb to T1{1}			45192	1.00	(17)	DISP	16.13	176.85
	Sus. + E1{1}	6664	10595		1.00	(16)	OCC	35.29	141.48
	Sus. + E2{1}	6664	10595		1.00	(16)	OCC	35.29	141.48
	Sus. + E3{1}	6664	4591		1.00	(16)	OCC	33.15	141.48
	Sus. + E4{1}	6664	4591		1.00	(16)	OCC	33.15	141.48
	Sus. + W1{1}	6664	6171		1.00	(16)	OCC	33.71	141.48
	Sus. + W2{1}	6664	6171		1.00	(16)	OCC	33.71	141.48
	Sus. + W3{1}	6664	2282		1.00	(16)	OCC	32.33	141.48
	Sus. + W4{1}	6664	2282		1.00	(16)	OCC	32.33	141.48

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ASME B31.1 (2014) CODE COMPLIANCE										
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.	
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type			
A12 +	Max P{1}						( 3)	HOOP	84.24	117.90
	GR + Max P{1}	29731			1.00	(15)	SUST	39.75	117.90	
	TR:Amb to T1{1}			19344	1.00	(17)	DISP	6.91	176.85	
	Amb to T1{1}			19344	1.00	(17)	DISP	6.91	176.85	
	Sus. + E1{1}	29731	6829		1.00	(16)	OCC	42.18	141.48	
	Sus. + E2{1}	29731	6829		1.00	(16)	OCC	42.18	141.48	
	Sus. + E3{1}	29731	8038		1.00	(16)	OCC	42.61	141.48	
	Sus. + E4{1}	29731	8038		1.00	(16)	OCC	42.61	141.48	
	Sus. + W1{1}	29731	4692		1.00	(16)	OCC	41.42	141.48	
	Sus. + W2{1}	29731	4692		1.00	(16)	OCC	41.42	141.48	
	Sus. + W3{1}	29731	2724		1.00	(16)	OCC	40.72	141.48	
	Sus. + W4{1}	29731	2724		1.00	(16)	OCC	40.72	141.48	
A12 -	Max P{1}						( 3)	HOOP	84.24	117.90
	GR + Max P{1}	29731			1.00	(15)	SUST	39.75	117.90	
	TR:Amb to T1{1}			19344	1.00	(17)	DISP	6.91	176.85	
	Amb to T1{1}			19344	1.00	(17)	DISP	6.91	176.85	
	Sus. + E1{1}	29731	6829		1.00	(16)	OCC	42.18	141.48	
	Sus. + E2{1}	29731	6829		1.00	(16)	OCC	42.18	141.48	
	Sus. + E3{1}	29731	8038		1.00	(16)	OCC	42.61	141.48	
	Sus. + E4{1}	29731	8038		1.00	(16)	OCC	42.61	141.48	
	Sus. + W1{1}	29731	4692		1.00	(16)	OCC	41.42	141.48	
	Sus. + W2{1}	29731	4692		1.00	(16)	OCC	41.42	141.48	
	Sus. + W3{1}	29731	2724		1.00	(16)	OCC	40.72	141.48	
	Sus. + W4{1}	29731	2724		1.00	(16)	OCC	40.72	141.48	
A11 F+	Max P{1}						( 3)	HOOP	84.24	117.90
	GR + Max P{1}	28802			1.00	(15)	SUST	39.41	117.90	



TR:Amb to T1{1}			21874	1.00	(17)	DISP	7.81	176.85
Amb to T1{1}			21874	1.00	(17)	DISP	7.81	176.85
Sus. + E1{1}	28802	6610		1.00	(16)	OCC	41.77	141.48
Sus. + E2{1}	28802	6610		1.00	(16)	OCC	41.77	141.48
Sus. + E3{1}	28802	7332		1.00	(16)	OCC	42.03	141.48
Sus. + E4{1}	28802	7332		1.00	(16)	OCC	42.03	141.48
Sus. + W1{1}	28802	4598		1.00	(16)	OCC	41.05	141.48
Sus. + W2{1}	28802	4598		1.00	(16)	OCC	41.05	141.48
Sus. + W3{1}	28802	2565		1.00	(16)	OCC	40.33	141.48
Sus. + W4{1}	28802	2565		1.00	(16)	OCC	40.33	141.48
All F- Max P{1}					( 3)	HOOP	84.24	117.90
GR + Max P{1}	28802			3.24	(15)	SUST	54.10	117.90
TR:Amb to T1{1}			21874	3.24	(17)	DISP	25.28	176.85
Amb to T1{1}			21874	3.24	(17)	DISP	25.28	176.85
Sus. + E1{1}	28802	6610		3.24	(16)	OCC	59.83	141.48
Sus. + E2{1}	28802	6610		3.24	(16)	OCC	59.83	141.48
Sus. + E3{1}	28802	7332		3.24	(16)	OCC	60.45	141.48
Sus. + E4{1}	28802	7332		3.24	(16)	OCC	60.45	141.48
Sus. + W1{1}	28802	4598		3.24	(16)	OCC	58.08	141.48
Sus. + W2{1}	28802	4598		3.24	(16)	OCC	58.08	141.48
Sus. + W3{1}	28802	2565		3.24	(16)	OCC	56.32	141.48
Sus. + W4{1}	28802	2565		3.24	(16)	OCC	56.32	141.48

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		ASME B31.1 (2014) CODE COMPLIANCE							
		(Moments in N.m )		(Stress in N/mm2 )					
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type	Code Stress	Code Allow.
All N+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	20748			3.24	(15)	SUST	47.12	117.90
	TR:Amb to T1{1}			50560	3.24	(17)	DISP	58.44	176.85
	Amb to T1{1}			50560	3.24	(17)	DISP	58.44	176.85
	Sus. + E1{1}	20748	2954		3.24	(16)	OCC	49.68	141.48
	Sus. + E2{1}	20748	2954		3.24	(16)	OCC	49.68	141.48
	Sus. + E3{1}	20748	1597		3.24	(16)	OCC	48.50	141.48
	Sus. + E4{1}	20748	1597		3.24	(16)	OCC	48.50	141.48
	Sus. + W1{1}	20748	2546		3.24	(16)	OCC	49.32	141.48
	Sus. + W2{1}	20748	2546		3.24	(16)	OCC	49.32	141.48
	Sus. + W3{1}	20748	1018		3.24	(16)	OCC	48.00	141.48
	Sus. + W4{1}	20748	1018		3.24	(16)	OCC	48.00	141.48
All N-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	20748			1.00	(15)	SUST	36.54	117.90
	TR:Amb to T1{1}			50560	1.00	(17)	DISP	18.05	176.85
	Amb to T1{1}			50560	1.00	(17)	DISP	18.05	176.85
	Sus. + E1{1}	20748	2954		1.00	(16)	OCC	37.59	141.48
	Sus. + E2{1}	20748	2954		1.00	(16)	OCC	37.59	141.48
	Sus. + E3{1}	20748	1597		1.00	(16)	OCC	37.11	141.48
	Sus. + E4{1}	20748	1597		1.00	(16)	OCC	37.11	141.48
	Sus. + W1{1}	20748	2546		1.00	(16)	OCC	37.45	141.48
	Sus. + W2{1}	20748	2546		1.00	(16)	OCC	37.45	141.48
	Sus. + W3{1}	20748	1018		1.00	(16)	OCC	36.90	141.48
	Sus. + W4{1}	20748	1018		1.00	(16)	OCC	36.90	141.48
A09 F+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	61159			1.00	(15)	SUST	50.96	117.90
	TR:Amb to T1{1}			74596	1.00	(17)	DISP	26.63	176.85
	Amb to T1{1}			74596	1.00	(17)	DISP	26.63	176.85
	Sus. + E1{1}	61159	1901		1.00	(16)	OCC	51.64	141.48
	Sus. + E2{1}	61159	1901		1.00	(16)	OCC	51.64	141.48
	Sus. + E3{1}	61159	2771		1.00	(16)	OCC	51.95	141.48
	Sus. + E4{1}	61159	2771		1.00	(16)	OCC	51.95	141.48
	Sus. + W1{1}	61159	1705		1.00	(16)	OCC	51.57	141.48
	Sus. + W2{1}	61159	1705		1.00	(16)	OCC	51.57	141.48
	Sus. + W3{1}	61159	814		1.00	(16)	OCC	51.25	141.48
	Sus. + W4{1}	61159	814		1.00	(16)	OCC	51.25	141.48
A09 N-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	34403			1.00	(15)	SUST	41.41	117.90
	TR:Amb to T1{1}			92721	1.00	(17)	DISP	33.10	176.85
	Amb to T1{1}			92721	1.00	(17)	DISP	33.10	176.85
	Sus. + E1{1}	34403	3973		1.00	(16)	OCC	42.83	141.48
	Sus. + E2{1}	34403	3973		1.00	(16)	OCC	42.83	141.48

Sus. + E3{1}	34403	2677	1.00	(16)	OCC	42.37	141.48
Sus. + E4{1}	34403	2677	1.00	(16)	OCC	42.37	141.48
Sus. + W1{1}	34403	855	1.00	(16)	OCC	41.72	141.48
Sus. + W2{1}	34403	855	1.00	(16)	OCC	41.72	141.48
Sus. + W3{1}	34403	945	1.00	(16)	OCC	41.75	141.48
Sus. + W4{1}	34403	945	1.00	(16)	OCC	41.75	141.48

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AutoPIPE Standard 10.01.00.08

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F			
A07 F+	Max P{1}						( 3) HOOP	84.24	117.90
	GR + Max P{1}	33773			1.00		(15) SUST	41.19	117.90
	TR:Amb to T1{1}				34687	1.00	(17) DISP	12.38	176.85
	Amb to T1{1}				34687	1.00	(17) DISP	12.38	176.85
	Sus. + E1{1}	33773	3941		1.00		(16) OCC	42.59	141.48
	Sus. + E2{1}	33773	3941		1.00		(16) OCC	42.59	141.48
	Sus. + E3{1}	33773	6265		1.00		(16) OCC	43.42	141.48
	Sus. + E4{1}	33773	6265		1.00		(16) OCC	43.42	141.48
	Sus. + W1{1}	33773	2289		1.00		(16) OCC	42.00	141.48
	Sus. + W2{1}	33773	2289		1.00		(16) OCC	42.00	141.48
	Sus. + W3{1}	33773	1908		1.00		(16) OCC	41.87	141.48
	Sus. + W4{1}	33773	1908		1.00		(16) OCC	41.87	141.48
A07 N-	Max P{1}						( 3) HOOP	84.24	117.90
	GR + Max P{1}	31673			1.00		(15) SUST	40.44	117.90
	TR:Amb to T1{1}				37650	1.00	(17) DISP	13.44	176.85
	Amb to T1{1}				37650	1.00	(17) DISP	13.44	176.85
	Sus. + E1{1}	31673	3832		1.00		(16) OCC	41.81	141.48
	Sus. + E2{1}	31673	3832		1.00		(16) OCC	41.81	141.48
	Sus. + E3{1}	31673	7045		1.00		(16) OCC	42.95	141.48
	Sus. + E4{1}	31673	7045		1.00		(16) OCC	42.95	141.48
	Sus. + W1{1}	31673	1656		1.00		(16) OCC	41.03	141.48
	Sus. + W2{1}	31673	1656		1.00		(16) OCC	41.03	141.48
	Sus. + W3{1}	31673	2149		1.00		(16) OCC	41.21	141.48
	Sus. + W4{1}	31673	2149		1.00		(16) OCC	41.21	141.48
A06 F+	Max P{1}						( 3) HOOP	84.24	117.90
	GR + Max P{1}	36345			1.00		(15) SUST	42.11	117.90
	TR:Amb to T1{1}				50046	1.00	(17) DISP	17.86	176.85
	Amb to T1{1}				50046	1.00	(17) DISP	17.86	176.85
	Sus. + E1{1}	36345	12113		1.00		(16) OCC	46.43	141.48
	Sus. + E2{1}	36345	12113		1.00		(16) OCC	46.43	141.48
	Sus. + E3{1}	36345	10122		1.00		(16) OCC	45.72	141.48
	Sus. + E4{1}	36345	10122		1.00		(16) OCC	45.72	141.48
	Sus. + W1{1}	36345	4031		1.00		(16) OCC	43.54	141.48
	Sus. + W2{1}	36345	4031		1.00		(16) OCC	43.54	141.48
	Sus. + W3{1}	36345	3390		1.00		(16) OCC	43.32	141.48
	Sus. + W4{1}	36345	3390		1.00		(16) OCC	43.32	141.48
A06 N-	Max P{1}						( 3) HOOP	84.24	117.90
	GR + Max P{1}	36166			1.00		(15) SUST	42.04	117.90
	TR:Amb to T1{1}				50034	1.00	(17) DISP	17.86	176.85
	Amb to T1{1}				50034	1.00	(17) DISP	17.86	176.85
	Sus. + E1{1}	36166	12131		1.00		(16) OCC	46.37	141.48
	Sus. + E2{1}	36166	12131		1.00		(16) OCC	46.37	141.48
	Sus. + E3{1}	36166	9725		1.00		(16) OCC	45.51	141.48
	Sus. + E4{1}	36166	9725		1.00		(16) OCC	45.51	141.48
	Sus. + W1{1}	36166	4103		1.00		(16) OCC	43.51	141.48
	Sus. + W2{1}	36166	4103		1.00		(16) OCC	43.51	141.48
	Sus. + W3{1}	36166	3274		1.00		(16) OCC	43.21	141.48
	Sus. + W4{1}	36166	3274		1.00		(16) OCC	43.21	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A05 F+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	12181			1.00	(15)	SUST	33.48	117.90
	TR:Amb to T1{1}			135391	1.00	(17)	DISP	48.33	176.85
	Amb to T1{1}			135391	1.00	(17)	DISP	48.33	176.85
	Sus. + E1{1}	12181	10882		1.00	(16)	OCC	37.36	141.48
	Sus. + E2{1}	12181	10882		1.00	(16)	OCC	37.36	141.48
	Sus. + E3{1}	12181	2815		1.00	(16)	OCC	34.48	141.48
	Sus. + E4{1}	12181	2815		1.00	(16)	OCC	34.48	141.48
	Sus. + W1{1}	12181	3833		1.00	(16)	OCC	34.85	141.48
	Sus. + W2{1}	12181	3833		1.00	(16)	OCC	34.85	141.48
	Sus. + W3{1}	12181	787		1.00	(16)	OCC	33.76	141.48
	Sus. + W4{1}	12181	787		1.00	(16)	OCC	33.76	141.48
A05 N-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	8960			1.00	(15)	SUST	32.33	117.90
	TR:Amb to T1{1}			115991	1.00	(17)	DISP	41.41	176.85
	Amb to T1{1}			115991	1.00	(17)	DISP	41.41	176.85
	Sus. + E1{1}	8960	6912		1.00	(16)	OCC	34.80	141.48
	Sus. + E2{1}	8960	6912		1.00	(16)	OCC	34.80	141.48
	Sus. + E3{1}	8960	6226		1.00	(16)	OCC	34.55	141.48
	Sus. + E4{1}	8960	6226		1.00	(16)	OCC	34.55	141.48
	Sus. + W1{1}	8960	2359		1.00	(16)	OCC	33.17	141.48
	Sus. + W2{1}	8960	2359		1.00	(16)	OCC	33.17	141.48
	Sus. + W3{1}	8960	2101		1.00	(16)	OCC	33.08	141.48
	Sus. + W4{1}	8960	2101		1.00	(16)	OCC	33.08	141.48
A04 F+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	11401			1.00	(15)	SUST	33.20	117.90
	TR:Amb to T1{1}			78263	1.00	(17)	DISP	27.94	176.85
	Amb to T1{1}			78263	1.00	(17)	DISP	27.94	176.85
	Sus. + E1{1}	11401	8799		1.00	(16)	OCC	36.34	141.48
	Sus. + E2{1}	11401	8799		1.00	(16)	OCC	36.34	141.48
	Sus. + E3{1}	11401	5889		1.00	(16)	OCC	35.30	141.48
	Sus. + E4{1}	11401	5889		1.00	(16)	OCC	35.30	141.48
	Sus. + W1{1}	11401	2984		1.00	(16)	OCC	34.27	141.48
	Sus. + W2{1}	11401	2984		1.00	(16)	OCC	34.27	141.48
	Sus. + W3{1}	11401	1573		1.00	(16)	OCC	33.76	141.48
	Sus. + W4{1}	11401	1573		1.00	(16)	OCC	33.76	141.48
A04 N-	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	26395			1.00	(15)	SUST	38.55	117.90
	TR:Amb to T1{1}			144011	1.00	(17)	DISP	51.41	176.85
	Amb to T1{1}			144011	1.00	(17)	DISP	51.41	176.85
	Sus. + E1{1}	26395	15818		1.00	(16)	OCC	44.20	141.48
	Sus. + E2{1}	26395	15818		1.00	(16)	OCC	44.20	141.48
	Sus. + E3{1}	26395	7115		1.00	(16)	OCC	41.09	141.48
	Sus. + E4{1}	26395	7115		1.00	(16)	OCC	41.09	141.48
	Sus. + W1{1}	26395	5496		1.00	(16)	OCC	40.52	141.48
	Sus. + W2{1}	26395	5496		1.00	(16)	OCC	40.52	141.48
	Sus. + W3{1}	26395	1629		1.00	(16)	OCC	39.14	141.48
	Sus. + W4{1}	26395	1629		1.00	(16)	OCC	39.14	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A02 F+	Max P{1}					( 3)	HOOP	84.24	117.90
	GR + Max P{1}	27725			1.00	(15)	SUST	39.03	117.90
	TR:Amb to T1{1}			184327	1.00	(17)	DISP	65.80	176.85
	Amb to T1{1}			184327	1.00	(17)	DISP	65.80	176.85
	Sus. + E1{1}	27725	7000		1.00	(16)	OCC	41.53	141.48
	Sus. + E2{1}	27725	7000		1.00	(16)	OCC	41.53	141.48
	Sus. + E3{1}	27725	11453		1.00	(16)	OCC	43.12	141.48
	Sus. + E4{1}	27725	11453		1.00	(16)	OCC	43.12	141.48
	Sus. + W1{1}	27725	2223		1.00	(16)	OCC	39.82	141.48
	Sus. + W2{1}	27725	2223		1.00	(16)	OCC	39.82	141.48
	Sus. + W3{1}	27725	2827		1.00	(16)	OCC	40.04	141.48
	Sus. + W4{1}	27725	2827		1.00	(16)	OCC	40.04	141.48

A02 N-	Max P{1}			( 3)	HOOP	84.24	117.90
	GR + Max P{1}	19446		1.00	(15) SUST	36.07	117.90
	TR:Amb to Tl{1}		193260	1.00	(17) DISP	68.99	176.85
	Amb to Tl{1}		193260	1.00	(17) DISP	68.99	176.85
	Sus. + E1{1}	19446	8875	1.00	(16) OCC	39.24	141.48
	Sus. + E2{1}	19446	8875	1.00	(16) OCC	39.24	141.48
	Sus. + E3{1}	19446	10978	1.00	(16) OCC	39.99	141.48
	Sus. + E4{1}	19446	10978	1.00	(16) OCC	39.99	141.48
	Sus. + W1{1}	19446	2494	1.00	(16) OCC	36.96	141.48
	Sus. + W2{1}	19446	2494	1.00	(16) OCC	36.96	141.48
	Sus. + W3{1}	19446	2661	1.00	(16) OCC	37.02	141.48
	Sus. + W4{1}	19446	2661	1.00	(16) OCC	37.02	141.48
A00	Max P{1}			( 3)	HOOP	84.24	117.90
	GR + Max P{1}	24575		1.00	(15) SUST	37.90	117.90
	TR:Amb to Tl{1}		199689	1.00	(17) DISP	71.28	176.85
	Amb to Tl{1}		199689	1.00	(17) DISP	71.28	176.85
	Sus. + E1{1}	24575	19115	1.00	(16) OCC	44.73	141.48
	Sus. + E2{1}	24575	19115	1.00	(16) OCC	44.73	141.48
	Sus. + E3{1}	24575	19138	1.00	(16) OCC	44.74	141.48
	Sus. + E4{1}	24575	19138	1.00	(16) OCC	44.74	141.48
	Sus. + W1{1}	24575	5140	1.00	(16) OCC	39.74	141.48
	Sus. + W2{1}	24575	5140	1.00	(16) OCC	39.74	141.48
	Sus. + W3{1}	24575	4518	1.00	(16) OCC	39.52	141.48
	Sus. + W4{1}	24575	4518	1.00	(16) OCC	39.52	141.48

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R E S U L T   S U M M A R Y  
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Maximum sustained stress ratio

Point : A06 F  
Stress N/mm2 : 95.79  
Allowable N/mm2 : 117.90  
Ratio : 0.81  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A04 N  
Stress N/mm2 : 166.44  
Allowable N/mm2 : 176.85  
Ratio : 0.94  
Load combination : Max Range

Maximum occasional stress ratio

Point : A06 F  
Stress N/mm2 : 118.01  
Allowable N/mm2 : 141.48  
Ratio : 0.83  
Load combination : Sus. + E1{1}

Maximum hoop stress ratio

Point : A02 N  
Stress N/mm2 : 84.24  
Allowable N/mm2 : 117.90  
Ratio : 0.71  
Load combination : Max P{1}

## **LAMPIRAN G**

*GENERAL PIPE STRESS REPORT (HYDROTEST CONDITION WITH  
EXPANSION JOINT, PIPE THICKNESS = 7,989 mm)*

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A07 F-	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	45587			6.89	(15) SUST	120.28	117.90**
	TR:Amb to T1{1}			14884	6.89	(17) DISP	38.87	176.85
	Amb to T1{1}			14884	6.89	(17) DISP	38.87	176.85
	Sus. + E1{1}	45587	3847		6.89	(16) OCC	127.81	141.48
	Sus. + E2{1}	45587	3847		6.89	(16) OCC	127.81	141.48
	Sus. + E3{1}	45587	9641		6.89	(16) OCC	139.16	141.48
	Sus. + E4{1}	45587	9641		6.89	(16) OCC	139.16	141.48
	Sus. + W1{1}	45587	2393		6.89	(16) OCC	124.97	141.48
	Sus. + W2{1}	45587	2393		6.89	(16) OCC	124.97	141.48
	Sus. + W3{1}	45587	2498		6.89	(16) OCC	125.17	141.48
	Sus. + W4{1}	45587	2498		6.89	(16) OCC	125.17	141.48
A07 N+	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	43712			6.89	(15) SUST	116.61	117.90
	TR:Amb to T1{1}			12164	6.89	(17) DISP	31.76	176.85
	Amb to T1{1}			12164	6.89	(17) DISP	31.76	176.85
	Sus. + E1{1}	43712	4681		6.89	(16) OCC	125.77	141.48
	Sus. + E2{1}	43712	4681		6.89	(16) OCC	125.77	141.48
	Sus. + E3{1}	43712	10027		6.89	(16) OCC	136.24	141.48
	Sus. + E4{1}	43712	10027		6.89	(16) OCC	136.24	141.48
	Sus. + W1{1}	43712	1704		6.89	(16) OCC	119.94	141.48
	Sus. + W2{1}	43712	1704		6.89	(16) OCC	119.94	141.48
	Sus. + W3{1}	43712	2670		6.89	(16) OCC	121.84	141.48
	Sus. + W4{1}	43712	2670		6.89	(16) OCC	121.84	141.48
A06 N+	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	35910			6.89	(15) SUST	101.33	117.90
	TR:Amb to T1{1}			47175	6.89	(17) DISP	123.19	176.85
	Amb to T1{1}			47175	6.89	(17) DISP	123.19	176.85
	Sus. + E1{1}	35910	13922		6.89	(16) OCC	128.59	141.48
	Sus. + E2{1}	35910	13922		6.89	(16) OCC	128.59	141.48
	Sus. + E3{1}	35910	10826		6.89	(16) OCC	122.53	141.48
	Sus. + E4{1}	35910	10826		6.89	(16) OCC	122.53	141.48
	Sus. + W1{1}	35910	4258		6.89	(16) OCC	109.67	141.48
	Sus. + W2{1}	35910	4258		6.89	(16) OCC	109.67	141.48
	Sus. + W3{1}	35910	3266		6.89	(16) OCC	107.72	141.48
	Sus. + W4{1}	35910	3266		6.89	(16) OCC	107.72	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A06 F-	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	36097			6.89	(15) SUST	101.69	117.90
	TR:Amb to T1{1}			44842	6.89	(17) DISP	117.09	176.85
	Amb to T1{1}			44842	6.89	(17) DISP	117.09	176.85
	Sus. + E1{1}	36097	13571		6.89	(16) OCC	128.27	141.48
	Sus. + E2{1}	36097	13571		6.89	(16) OCC	128.27	141.48
	Sus. + E3{1}	36097	11029		6.89	(16) OCC	123.29	141.48
	Sus. + E4{1}	36097	11029		6.89	(16) OCC	123.29	141.48
	Sus. + W1{1}	36097	4107		6.89	(16) OCC	109.74	141.48
	Sus. + W2{1}	36097	4107		6.89	(16) OCC	109.74	141.48
	Sus. + W3{1}	36097	3340		6.89	(16) OCC	108.23	141.48
	Sus. + W4{1}	36097	3340		6.89	(16) OCC	108.23	141.48
A05 N+	Max P{1}					( 3) HOOP	91.29	117.90

GR + Max P{1}	21304		3.20	(15)	SUST	50.35	117.90
TR:Amb to T1{1}			90070	3.20	(17)	DISP	109.08 176.85
Amb to T1{1}			90070	3.20	(17)	DISP	109.08 176.85
Sus. + E1{1}	21304	13391		3.20	(16)	OCC	62.51 141.48
Sus. + E2{1}	21304	13391		3.20	(16)	OCC	62.51 141.48
Sus. + E3{1}	21304	8901		3.20	(16)	OCC	58.44 141.48
Sus. + E4{1}	21304	8901		3.20	(16)	OCC	58.44 141.48
Sus. + W1{1}	21304	3646		3.20	(16)	OCC	53.66 141.48
Sus. + W2{1}	21304	3646		3.20	(16)	OCC	53.66 141.48
Sus. + W3{1}	21304	2348		3.20	(16)	OCC	52.48 141.48
Sus. + W4{1}	21304	2348		3.20	(16)	OCC	52.48 141.48
A05 F- Max P{1}							
GR + Max P{1}	20864			( 3)	HOOP	91.29	117.90
TR:Amb to T1{1}			86605	3.20	(15)	SUST	49.95 117.90
Amb to T1{1}			86605	3.20	(17)	DISP	104.89 176.85
Sus. + E1{1}	20864	16677		3.20	(16)	OCC	65.10 141.48
Sus. + E2{1}	20864	16677		3.20	(16)	OCC	65.10 141.48
Sus. + E3{1}	20864	7382		3.20	(16)	OCC	56.66 141.48
Sus. + E4{1}	20864	7382		3.20	(16)	OCC	56.66 141.48
Sus. + W1{1}	20864	4892		3.20	(16)	OCC	54.39 141.48
Sus. + W2{1}	20864	4892		3.20	(16)	OCC	54.39 141.48
Sus. + W3{1}	20864	1575		3.20	(16)	OCC	51.38 141.48
Sus. + W4{1}	20864	1575		3.20	(16)	OCC	51.38 141.48
A10 + Max P{1}							
GR + Max P{1}	178132			( 3)	HOOP	91.29	117.90
TR:Amb to T1{1}			48229	1.00	(15)	SUST	98.50 117.90
Amb to T1{1}			48229	1.00	(17)	DISP	18.28 176.85
Sus. + E1{1}	178132	5491		1.00	(16)	OCC	100.59 141.48
Sus. + E2{1}	178132	5491		1.00	(16)	OCC	100.59 141.48
Sus. + E3{1}	178132	4463		1.00	(16)	OCC	100.20 141.48
Sus. + E4{1}	178132	4463		1.00	(16)	OCC	100.20 141.48
Sus. + W1{1}	178132	1768		1.00	(16)	OCC	99.17 141.48
Sus. + W2{1}	178132	1768		1.00	(16)	OCC	99.17 141.48
Sus. + W3{1}	178132	1129		1.00	(16)	OCC	98.93 141.48
Sus. + W4{1}	178132	1129		1.00	(16)	OCC	98.93 141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F			
A10 - Max P{1}						( 3)	HOOP	91.29	117.90
GR + Max P{1}	178132				1.00	(15)	SUST	98.50	117.90
TR:Amb to T1{1}				48229	1.00	(17)	DISP	18.28	176.85
Amb to T1{1}				48229	1.00	(17)	DISP	18.28	176.85
Sus. + E1{1}	178132	5491			1.00	(16)	OCC	100.59	141.48
Sus. + E2{1}	178132	5491			1.00	(16)	OCC	100.59	141.48
Sus. + E3{1}	178132	4463			1.00	(16)	OCC	100.20	141.48
Sus. + E4{1}	178132	4463			1.00	(16)	OCC	100.20	141.48
Sus. + W1{1}	178132	1768			1.00	(16)	OCC	99.17	141.48
Sus. + W2{1}	178132	1768			1.00	(16)	OCC	99.17	141.48
Sus. + W3{1}	178132	1129			1.00	(16)	OCC	98.93	141.48
Sus. + W4{1}	178132	1129			1.00	(16)	OCC	98.93	141.48
A09 F- Max P{1}									
GR + Max P{1}	66199				3.20	(15)	SUST	91.13	117.90
TR:Amb to T1{1}				70349	3.20	(17)	DISP	85.20	176.85
Amb to T1{1}				70349	3.20	(17)	DISP	85.20	176.85
Sus. + E1{1}	66199	4590			3.20	(16)	OCC	95.30	141.48
Sus. + E2{1}	66199	4590			3.20	(16)	OCC	95.30	141.48
Sus. + E3{1}	66199	5913			3.20	(16)	OCC	96.50	141.48
Sus. + E4{1}	66199	5913			3.20	(16)	OCC	96.50	141.48
Sus. + W1{1}	66199	1956			3.20	(16)	OCC	92.91	141.48
Sus. + W2{1}	66199	1956			3.20	(16)	OCC	92.91	141.48
Sus. + W3{1}	66199	1416			3.20	(16)	OCC	92.42	141.48
Sus. + W4{1}	66199	1416			3.20	(16)	OCC	92.42	141.48
A15 Max P{1}									
GR + Max P{1}	9148				1.00	(15)	SUST	34.47	117.90
TR:Amb to T1{1}				22390	1.00	(17)	DISP	8.48	176.85
Amb to T1{1}				22390	1.00	(17)	DISP	8.48	176.85
Sus. + E1{1}	9148	31611			1.00	(16)	OCC	46.45	141.48

Sus. + E2{1}	9148	31611	1.00	(16)	OCC	46.45	141.48
Sus. + E3{1}	9148	32848	1.00	(16)	OCC	46.91	141.48
Sus. + E4{1}	9148	32848	1.00	(16)	OCC	46.91	141.48
Sus. + W1{1}	9148	18742	1.00	(16)	OCC	41.57	141.48
Sus. + W2{1}	9148	18742	1.00	(16)	OCC	41.57	141.48
Sus. + W3{1}	9148	15013	1.00	(16)	OCC	40.16	141.48
Sus. + W4{1}	9148	15013	1.00	(16)	OCC	40.16	141.48

A14 F+ Max P{1}				( 3)	HOOP	91.29	117.90	
GR + Max P{1}	14680		1.00	(15)	SUST	36.56	117.90	
TR:Amb to T1{1}			35667	1.00	(17)	DISP	13.52	176.85
Amb to T1{1}			35667	1.00	(17)	DISP	13.52	176.85
Sus. + E1{1}	14680	16360	1.00	(16)	OCC	42.76	141.48	
Sus. + E2{1}	14680	16360	1.00	(16)	OCC	42.76	141.48	
Sus. + E3{1}	14680	7837	1.00	(16)	OCC	39.53	141.48	
Sus. + E4{1}	14680	7837	1.00	(16)	OCC	39.53	141.48	
Sus. + W1{1}	14680	8180	1.00	(16)	OCC	39.66	141.48	
Sus. + W2{1}	14680	8180	1.00	(16)	OCC	39.66	141.48	
Sus. + W3{1}	14680	3893	1.00	(16)	OCC	38.04	141.48	
Sus. + W4{1}	14680	3893	1.00	(16)	OCC	38.04	141.48	

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ASME B31.1 (2014) CODE COMPLIANCE  
(Moments in N.m ) (Stress in N/mm2 )

Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.
A14 F- Max P{1}						( 3) HOOP	91.29	117.90
GR + Max P{1}		14680			3.20	(15) SUST	44.33	117.90
TR:Amb to T1{1}				35667	3.20	(17) DISP	43.20	176.85
Amb to T1{1}				35667	3.20	(17) DISP	43.20	176.85
Sus. + E1{1}		14680	16360		3.20	(16) OCC	59.19	141.48
Sus. + E2{1}		14680	16360		3.20	(16) OCC	59.19	141.48
Sus. + E3{1}		14680	7837		3.20	(16) OCC	51.45	141.48
Sus. + E4{1}		14680	7837		3.20	(16) OCC	51.45	141.48
Sus. + W1{1}		14680	8180		3.20	(16) OCC	51.76	141.48
Sus. + W2{1}		14680	8180		3.20	(16) OCC	51.76	141.48
Sus. + W3{1}		14680	3893		3.20	(16) OCC	47.87	141.48
Sus. + W4{1}		14680	3893		3.20	(16) OCC	47.87	141.48
A14 N+ Max P{1}						( 3) HOOP	91.29	117.90
GR + Max P{1}		5499			3.20	(15) SUST	35.99	117.90
TR:Amb to T1{1}				22825	3.20	(17) DISP	27.64	176.85
Amb to T1{1}				22825	3.20	(17) DISP	27.64	176.85
Sus. + E1{1}		5499	12843		3.20	(16) OCC	47.66	141.48
Sus. + E2{1}		5499	12843		3.20	(16) OCC	47.66	141.48
Sus. + E3{1}		5499	6158		3.20	(16) OCC	41.59	141.48
Sus. + E4{1}		5499	6158		3.20	(16) OCC	41.59	141.48
Sus. + W1{1}		5499	5775		3.20	(16) OCC	41.24	141.48
Sus. + W2{1}		5499	5775		3.20	(16) OCC	41.24	141.48
Sus. + W3{1}		5499	3214		3.20	(16) OCC	38.91	141.48
Sus. + W4{1}		5499	3214		3.20	(16) OCC	38.91	141.48
A14 N- Max P{1}						( 3) HOOP	91.29	117.90
GR + Max P{1}		5499			1.00	(15) SUST	33.08	117.90
TR:Amb to T1{1}				22825	1.00	(17) DISP	8.65	176.85
Amb to T1{1}				22825	1.00	(17) DISP	8.65	176.85
Sus. + E1{1}		5499	12843		1.00	(16) OCC	37.95	141.48
Sus. + E2{1}		5499	12843		1.00	(16) OCC	37.95	141.48
Sus. + E3{1}		5499	6158		1.00	(16) OCC	35.42	141.48
Sus. + E4{1}		5499	6158		1.00	(16) OCC	35.42	141.48
Sus. + W1{1}		5499	5775		1.00	(16) OCC	35.27	141.48
Sus. + W2{1}		5499	5775		1.00	(16) OCC	35.27	141.48
Sus. + W3{1}		5499	3214		1.00	(16) OCC	34.30	141.48
Sus. + W4{1}		5499	3214		1.00	(16) OCC	34.30	141.48
A13 F+ Max P{1}						( 3) HOOP	91.29	117.90
GR + Max P{1}		15309			1.00	(15) SUST	36.80	117.90
TR:Amb to T1{1}				43643	1.00	(17) DISP	16.54	176.85
Amb to T1{1}				43643	1.00	(17) DISP	16.54	176.85
Sus. + E1{1}		15309	8223		1.00	(16) OCC	39.92	141.48
Sus. + E2{1}		15309	8223		1.00	(16) OCC	39.92	141.48
Sus. + E3{1}		15309	3755		1.00	(16) OCC	38.22	141.48
Sus. + E4{1}		15309	3755		1.00	(16) OCC	38.22	141.48
Sus. + W1{1}		15309	4702		1.00	(16) OCC	38.58	141.48



Sus. + W2{1}	15309	4702	1.00	(16)	OCC	38.58	141.48
Sus. + W3{1}	15309	1781	1.00	(16)	OCC	37.48	141.48
Sus. + W4{1}	15309	1781	1.00	(16)	OCC	37.48	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )	Ma (Sus.)	Mb (Occ.)			
A13 F-	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	15309			3.20	(15) SUST	44.90	117.90
	TR:Amb to Tl{1}			43643	3.20	(17) DISP	52.86	176.85
	Amb to Tl{1}			43643	3.20	(17) DISP	52.86	176.85
	Sus. + E1{1}	15309	8223		3.20	(16) OCC	52.37	141.48
	Sus. + E2{1}	15309	8223		3.20	(16) OCC	52.37	141.48
	Sus. + E3{1}	15309	3755		3.20	(16) OCC	48.32	141.48
	Sus. + E4{1}	15309	3755		3.20	(16) OCC	48.32	141.48
	Sus. + W1{1}	15309	4702		3.20	(16) OCC	49.18	141.48
	Sus. + W2{1}	15309	4702		3.20	(16) OCC	49.18	141.48
	Sus. + W3{1}	15309	1781		3.20	(16) OCC	46.52	141.48
	Sus. + W4{1}	15309	1781		3.20	(16) OCC	46.52	141.48
A13 N+	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	9084			3.20	(15) SUST	39.25	117.90
	TR:Amb to Tl{1}			56658	3.20	(17) DISP	68.62	176.85
	Amb to Tl{1}			56658	3.20	(17) DISP	68.62	176.85
	Sus. + E1{1}	9084	10465		3.20	(16) OCC	48.76	141.48
	Sus. + E2{1}	9084	10465		3.20	(16) OCC	48.76	141.48
	Sus. + E3{1}	9084	5035		3.20	(16) OCC	43.82	141.48
	Sus. + E4{1}	9084	5035		3.20	(16) OCC	43.82	141.48
	Sus. + W1{1}	9084	6553		3.20	(16) OCC	45.20	141.48
	Sus. + W2{1}	9084	6553		3.20	(16) OCC	45.20	141.48
	Sus. + W3{1}	9084	2635		3.20	(16) OCC	41.64	141.48
	Sus. + W4{1}	9084	2635		3.20	(16) OCC	41.64	141.48
A13 N-	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	9084			1.00	(15) SUST	34.44	117.90
	TR:Amb to Tl{1}			56658	1.00	(17) DISP	21.47	176.85
	Amb to Tl{1}			56658	1.00	(17) DISP	21.47	176.85
	Sus. + E1{1}	9084	10465		1.00	(16) OCC	38.41	141.48
	Sus. + E2{1}	9084	10465		1.00	(16) OCC	38.41	141.48
	Sus. + E3{1}	9084	5035		1.00	(16) OCC	36.35	141.48
	Sus. + E4{1}	9084	5035		1.00	(16) OCC	36.35	141.48
	Sus. + W1{1}	9084	6553		1.00	(16) OCC	36.92	141.48
	Sus. + W2{1}	9084	6553		1.00	(16) OCC	36.92	141.48
	Sus. + W3{1}	9084	2635		1.00	(16) OCC	35.44	141.48
	Sus. + W4{1}	9084	2635		1.00	(16) OCC	35.44	141.48
A12 +	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	32550			1.00	(15) SUST	43.33	117.90
	TR:Amb to Tl{1}			31958	1.00	(17) DISP	12.11	176.85
	Amb to Tl{1}			31958	1.00	(17) DISP	12.11	176.85
	Sus. + E1{1}	32550	7942		1.00	(16) OCC	46.34	141.48
	Sus. + E2{1}	32550	7942		1.00	(16) OCC	46.34	141.48
	Sus. + E3{1}	32550	8786		1.00	(16) OCC	46.66	141.48
	Sus. + E4{1}	32550	8786		1.00	(16) OCC	46.66	141.48
	Sus. + W1{1}	32550	4973		1.00	(16) OCC	45.22	141.48
	Sus. + W2{1}	32550	4973		1.00	(16) OCC	45.22	141.48
	Sus. + W3{1}	32550	3165		1.00	(16) OCC	44.53	141.48
	Sus. + W4{1}	32550	3165		1.00	(16) OCC	44.53	141.48

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Point	Load	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load	Code	Code
		(Moments in N.m )	(Stress in N/mm2 )	Ma	Mb			

name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no.	type	Stress	Allow.
A12 -	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	32550			1.00	(15)	SUST	43.33	117.90
	TR:Amb to T1{1}			31958	1.00	(17)	DISP	12.11	176.85
	Amb to T1{1}			31958	1.00	(17)	DISP	12.11	176.85
	Sus. + E1{1}	32550	7942		1.00	(16)	OCC	46.34	141.48
	Sus. + E2{1}	32550	7942		1.00	(16)	OCC	46.34	141.48
	Sus. + E3{1}	32550	8786		1.00	(16)	OCC	46.66	141.48
	Sus. + E4{1}	32550	8786		1.00	(16)	OCC	46.66	141.48
	Sus. + W1{1}	32550	4973		1.00	(16)	OCC	45.22	141.48
	Sus. + W2{1}	32550	4973		1.00	(16)	OCC	45.22	141.48
	Sus. + W3{1}	32550	3165		1.00	(16)	OCC	44.53	141.48
	Sus. + W4{1}	32550	3165		1.00	(16)	OCC	44.53	141.48
All F+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	31676			1.00	(15)	SUST	43.00	117.90
	TR:Amb to T1{1}			33284	1.00	(17)	DISP	12.61	176.85
	Amb to T1{1}			33284	1.00	(17)	DISP	12.61	176.85
	Sus. + E1{1}	31676	7455		1.00	(16)	OCC	45.83	141.48
	Sus. + E2{1}	31676	7455		1.00	(16)	OCC	45.83	141.48
	Sus. + E3{1}	31676	8153		1.00	(16)	OCC	46.09	141.48
	Sus. + E4{1}	31676	8153		1.00	(16)	OCC	46.09	141.48
	Sus. + W1{1}	31676	4821		1.00	(16)	OCC	44.83	141.48
	Sus. + W2{1}	31676	4821		1.00	(16)	OCC	44.83	141.48
	Sus. + W3{1}	31676	3012		1.00	(16)	OCC	44.14	141.48
	Sus. + W4{1}	31676	3012		1.00	(16)	OCC	44.14	141.48
All F-	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	31676			3.20	(15)	SUST	59.77	117.90
	TR:Amb to T1{1}			33284	3.20	(17)	DISP	40.31	176.85
	Amb to T1{1}			33284	3.20	(17)	DISP	40.31	176.85
	Sus. + E1{1}	31676	7455		3.20	(16)	OCC	66.54	141.48
	Sus. + E2{1}	31676	7455		3.20	(16)	OCC	66.54	141.48
	Sus. + E3{1}	31676	8153		3.20	(16)	OCC	67.18	141.48
	Sus. + E4{1}	31676	8153		3.20	(16)	OCC	67.18	141.48
	Sus. + W1{1}	31676	4821		3.20	(16)	OCC	64.15	141.48
	Sus. + W2{1}	31676	4821		3.20	(16)	OCC	64.15	141.48
	Sus. + W3{1}	31676	3012		3.20	(16)	OCC	62.51	141.48
	Sus. + W4{1}	31676	3012		3.20	(16)	OCC	62.51	141.48
All N+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	21142			3.20	(15)	SUST	50.20	117.90
	TR:Amb to T1{1}			37109	3.20	(17)	DISP	44.94	176.85
	Amb to T1{1}			37109	3.20	(17)	DISP	44.94	176.85
	Sus. + E1{1}	21142	2889		3.20	(16)	OCC	52.83	141.48
	Sus. + E2{1}	21142	2889		3.20	(16)	OCC	52.83	141.48
	Sus. + E3{1}	21142	2602		3.20	(16)	OCC	52.57	141.48
	Sus. + E4{1}	21142	2602		3.20	(16)	OCC	52.57	141.48
	Sus. + W1{1}	21142	2095		3.20	(16)	OCC	52.11	141.48
	Sus. + W2{1}	21142	2095		3.20	(16)	OCC	52.11	141.48
	Sus. + W3{1}	21142	1407		3.20	(16)	OCC	51.48	141.48
	Sus. + W4{1}	21142	1407		3.20	(16)	OCC	51.48	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type		
All N-	Max P{1}						( 3)	HOOP	91.29 117.90
	GR + Max P{1}	21142			1.00	(15)	SUST	39.01	117.90
	TR:Amb to T1{1}			37109	1.00	(17)	DISP	14.06	176.85
	Amb to T1{1}			37109	1.00	(17)	DISP	14.06	176.85
	Sus. + E1{1}	21142	2889		1.00	(16)	OCC	40.11	141.48
	Sus. + E2{1}	21142	2889		1.00	(16)	OCC	40.11	141.48
	Sus. + E3{1}	21142	2602		1.00	(16)	OCC	40.00	141.48
	Sus. + E4{1}	21142	2602		1.00	(16)	OCC	40.00	141.48
	Sus. + W1{1}	21142	2095		1.00	(16)	OCC	39.80	141.48
	Sus. + W2{1}	21142	2095		1.00	(16)	OCC	39.80	141.48
	Sus. + W3{1}	21142	1407		1.00	(16)	OCC	39.54	141.48
	Sus. + W4{1}	21142	1407		1.00	(16)	OCC	39.54	141.48
A09 F+	Max P{1}						( 3)	HOOP	91.29 117.90
	GR + Max P{1}	66199			1.00	(15)	SUST	56.09	117.90

TR:Amb to T1{1}			70349	1.00	(17)	DISP	26.66	176.85
Amb to T1{1}			70349	1.00	(17)	DISP	26.66	176.85
Sus. + E1{1}	66199	4590		1.00	(16)	OCC	57.83	141.48
Sus. + E2{1}	66199	4590		1.00	(16)	OCC	57.83	141.48
Sus. + E3{1}	66199	5913		1.00	(16)	OCC	58.33	141.48
Sus. + E4{1}	66199	5913		1.00	(16)	OCC	58.33	141.48
Sus. + W1{1}	66199	1956		1.00	(16)	OCC	56.83	141.48
Sus. + W2{1}	66199	1956		1.00	(16)	OCC	56.83	141.48
Sus. + W3{1}	66199	1416		1.00	(16)	OCC	56.62	141.48
Sus. + W4{1}	66199	1416		1.00	(16)	OCC	56.62	141.48
A09 N+ Max P{1}								
GR + Max P{1}	35950			3.20	(15)	SUST	63.65	117.90
TR:Amb to T1{1}			68489	3.20	(17)	DISP	82.95	176.85
Amb to T1{1}			68489	3.20	(17)	DISP	82.95	176.85
Sus. + E1{1}	35950	6029		3.20	(16)	OCC	69.13	141.48
Sus. + E2{1}	35950	6029		3.20	(16)	OCC	69.13	141.48
Sus. + E3{1}	35950	6755		3.20	(16)	OCC	69.79	141.48
Sus. + E4{1}	35950	6755		3.20	(16)	OCC	69.79	141.48
Sus. + W1{1}	35950	1599		3.20	(16)	OCC	65.11	141.48
Sus. + W2{1}	35950	1599		3.20	(16)	OCC	65.11	141.48
Sus. + W3{1}	35950	1792		3.20	(16)	OCC	65.28	141.48
Sus. + W4{1}	35950	1792		3.20	(16)	OCC	65.28	141.48
A09 N- Max P{1}								
GR + Max P{1}	35950			1.00	(15)	SUST	44.62	117.90
TR:Amb to T1{1}			68489	1.00	(17)	DISP	25.95	176.85
Amb to T1{1}			68489	1.00	(17)	DISP	25.95	176.85
Sus. + E1{1}	35950	6029		1.00	(16)	OCC	46.91	141.48
Sus. + E2{1}	35950	6029		1.00	(16)	OCC	46.91	141.48
Sus. + E3{1}	35950	6755		1.00	(16)	OCC	47.18	141.48
Sus. + E4{1}	35950	6755		1.00	(16)	OCC	47.18	141.48
Sus. + W1{1}	35950	1599		1.00	(16)	OCC	45.23	141.48
Sus. + W2{1}	35950	1599		1.00	(16)	OCC	45.23	141.48
Sus. + W3{1}	35950	1792		1.00	(16)	OCC	45.30	141.48
Sus. + W4{1}	35950	1792		1.00	(16)	OCC	45.30	141.48

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ASME B31.1 (2014) CODE COMPLIANCE								
(Moments in N.m )				(Stress in N/mm2 )				
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.
A08 + Max P{1}								
GR + Max P{1}		30152			1.00	(15) SUST	42.43	117.90
TR:Amb to T1{1}				143577	1.00	(17) DISP	54.41	176.85
Amb to T1{1}				143577	1.00	(17) DISP	54.41	176.85
Sus. + E1{1}		30152	56409		1.00	(16) OCC	63.80	141.48
Sus. + E2{1}		30152	56409		1.00	(16) OCC	63.80	141.48
Sus. + E3{1}		30152	40616		1.00	(16) OCC	57.82	141.48
Sus. + E4{1}		30152	40616		1.00	(16) OCC	57.82	141.48
Sus. + W1{1}		30152	24947		1.00	(16) OCC	51.88	141.48
Sus. + W2{1}		30152	24947		1.00	(16) OCC	51.88	141.48
Sus. + W3{1}		30152	13259		1.00	(16) OCC	47.45	141.48
Sus. + W4{1}		30152	13259		1.00	(16) OCC	47.45	141.48
A08 - Max P{1}								
GR + Max P{1}		30152			1.00	(15) SUST	42.43	117.90
TR:Amb to T1{1}				143577	1.00	(17) DISP	54.41	176.85
Amb to T1{1}				143577	1.00	(17) DISP	54.41	176.85
Sus. + E1{1}		30152	56409		1.00	(16) OCC	63.80	141.48
Sus. + E2{1}		30152	56409		1.00	(16) OCC	63.80	141.48
Sus. + E3{1}		30152	40616		1.00	(16) OCC	57.82	141.48
Sus. + E4{1}		30152	40616		1.00	(16) OCC	57.82	141.48
Sus. + W1{1}		30152	24947		1.00	(16) OCC	51.88	141.48
Sus. + W2{1}		30152	24947		1.00	(16) OCC	51.88	141.48
Sus. + W3{1}		30152	13259		1.00	(16) OCC	47.45	141.48
Sus. + W4{1}		30152	13259		1.00	(16) OCC	47.45	141.48
A07 F+ Max P{1}								
GR + Max P{1}		45587			1.00	(15) SUST	48.27	117.90
TR:Amb to T1{1}				14884	1.00	(17) DISP	5.64	176.85
Amb to T1{1}				14884	1.00	(17) DISP	5.64	176.85
Sus. + E1{1}		45587	3847		1.00	(16) OCC	49.73	141.48
Sus. + E2{1}		45587	3847		1.00	(16) OCC	49.73	141.48

Sus. + E3{1}	45587	9641	1.00	(16)	OCC	51.93	141.48
Sus. + E4{1}	45587	9641	1.00	(16)	OCC	51.93	141.48
Sus. + W1{1}	45587	2393	1.00	(16)	OCC	49.18	141.48
Sus. + W2{1}	45587	2393	1.00	(16)	OCC	49.18	141.48
Sus. + W3{1}	45587	2498	1.00	(16)	OCC	49.22	141.48
Sus. + W4{1}	45587	2498	1.00	(16)	OCC	49.22	141.48

A07 N- Max P{1}				( 3)	HOOP	91.29	117.90
GR + Max P{1}	43712		1.00	(15)	SUST	47.56	117.90
TR:Amb to T1{1}			12164	1.00	(17)	DISP	4.61 176.85
Amb to T1{1}			12164	1.00	(17)	DISP	4.61 176.85
Sus. + E1{1}	43712	4681	1.00	(16)	OCC	49.34	141.48
Sus. + E2{1}	43712	4681	1.00	(16)	OCC	49.34	141.48
Sus. + E3{1}	43712	10027	1.00	(16)	OCC	51.36	141.48
Sus. + E4{1}	43712	10027	1.00	(16)	OCC	51.36	141.48
Sus. + W1{1}	43712	1704	1.00	(16)	OCC	48.21	141.48
Sus. + W2{1}	43712	1704	1.00	(16)	OCC	48.21	141.48
Sus. + W3{1}	43712	2670	1.00	(16)	OCC	48.58	141.48
Sus. + W4{1}	43712	2670	1.00	(16)	OCC	48.58	141.48

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(Moments in N.m ) (Stress in N/mm2 )

Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.
A06 F+ Max P{1}						( 3) HOOP	91.29	117.90
GR + Max P{1}		36097			1.00	(15) SUST	44.68	117.90
TR:Amb to T1{1}				44842	1.00	(17) DISP	16.99	176.85
Amb to T1{1}				44842	1.00	(17) DISP	16.99	176.85
Sus. + E1{1}		36097	13571		1.00	(16) OCC	49.82	141.48
Sus. + E2{1}		36097	13571		1.00	(16) OCC	49.82	141.48
Sus. + E3{1}		36097	11029		1.00	(16) OCC	48.86	141.48
Sus. + E4{1}		36097	11029		1.00	(16) OCC	48.86	141.48
Sus. + W1{1}		36097	4107		1.00	(16) OCC	46.23	141.48
Sus. + W2{1}		36097	4107		1.00	(16) OCC	46.23	141.48
Sus. + W3{1}		36097	3340		1.00	(16) OCC	45.94	141.48
Sus. + W4{1}		36097	3340		1.00	(16) OCC	45.94	141.48
A06 N- Max P{1}						( 3) HOOP	91.29	117.90
GR + Max P{1}		35910			1.00	(15) SUST	44.61	117.90
TR:Amb to T1{1}				47175	1.00	(17) DISP	17.88	176.85
Amb to T1{1}				47175	1.00	(17) DISP	17.88	176.85
Sus. + E1{1}		35910	13922		1.00	(16) OCC	49.88	141.48
Sus. + E2{1}		35910	13922		1.00	(16) OCC	49.88	141.48
Sus. + E3{1}		35910	10826		1.00	(16) OCC	48.71	141.48
Sus. + E4{1}		35910	10826		1.00	(16) OCC	48.71	141.48
Sus. + W1{1}		35910	4258		1.00	(16) OCC	46.22	141.48
Sus. + W2{1}		35910	4258		1.00	(16) OCC	46.22	141.48
Sus. + W3{1}		35910	3266		1.00	(16) OCC	45.85	141.48
Sus. + W4{1}		35910	3266		1.00	(16) OCC	45.85	141.48
A05 F+ Max P{1}						( 3) HOOP	91.29	117.90
GR + Max P{1}		20864			1.00	(15) SUST	38.91	117.90
TR:Amb to T1{1}				86605	1.00	(17) DISP	32.82	176.85
Amb to T1{1}				86605	1.00	(17) DISP	32.82	176.85
Sus. + E1{1}		20864	16677		1.00	(16) OCC	45.23	141.48
Sus. + E2{1}		20864	16677		1.00	(16) OCC	45.23	141.48
Sus. + E3{1}		20864	7382		1.00	(16) OCC	41.70	141.48
Sus. + E4{1}		20864	7382		1.00	(16) OCC	41.70	141.48
Sus. + W1{1}		20864	4892		1.00	(16) OCC	40.76	141.48
Sus. + W2{1}		20864	4892		1.00	(16) OCC	40.76	141.48
Sus. + W3{1}		20864	1575		1.00	(16) OCC	39.50	141.48
Sus. + W4{1}		20864	1575		1.00	(16) OCC	39.50	141.48
A05 N- Max P{1}						( 3) HOOP	91.29	117.90
GR + Max P{1}		21304			1.00	(15) SUST	39.07	117.90
TR:Amb to T1{1}				90070	1.00	(17) DISP	34.13	176.85
Amb to T1{1}				90070	1.00	(17) DISP	34.13	176.85
Sus. + E1{1}		21304	13391		1.00	(16) OCC	44.15	141.48
Sus. + E2{1}		21304	13391		1.00	(16) OCC	44.15	141.48
Sus. + E3{1}		21304	8901		1.00	(16) OCC	42.45	141.48
Sus. + E4{1}		21304	8901		1.00	(16) OCC	42.45	141.48
Sus. + W1{1}		21304	3646		1.00	(16) OCC	40.45	141.48
Sus. + W2{1}		21304	3646		1.00	(16) OCC	40.45	141.48

Sus. + W3{1}	21304	2348	1.00	(16)	OCC	39.96	141.48
Sus. + W4{1}	21304	2348	1.00	(16)	OCC	39.96	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )			S.I.F			
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A04 F+	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	19648			1.00	(15) SUST	38.44	117.90
	TR:Amb to T1{1}			74411	1.00	(17) DISP	28.20	176.85
	Amb to T1{1}			74411	1.00	(17) DISP	28.20	176.85
	Sus. + E1{1}	19648	10999		1.00	(16) OCC	42.61	141.48
	Sus. + E2{1}	19648	10999		1.00	(16) OCC	42.61	141.48
	Sus. + E3{1}	19648	11344		1.00	(16) OCC	42.74	141.48
	Sus. + E4{1}	19648	11344		1.00	(16) OCC	42.74	141.48
	Sus. + W1{1}	19648	3017		1.00	(16) OCC	39.59	141.48
	Sus. + W2{1}	19648	3017		1.00	(16) OCC	39.59	141.48
	Sus. + W3{1}	19648	2798		1.00	(16) OCC	39.51	141.48
	Sus. + W4{1}	19648	2798		1.00	(16) OCC	39.51	141.48
A04 F-	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	19648			3.20	(15) SUST	48.85	117.90
	TR:Amb to T1{1}			74411	3.20	(17) DISP	90.12	176.85
	Amb to T1{1}			74411	3.20	(17) DISP	90.12	176.85
	Sus. + E1{1}	19648	10999		3.20	(16) OCC	58.84	141.48
	Sus. + E2{1}	19648	10999		3.20	(16) OCC	58.84	141.48
	Sus. + E3{1}	19648	11344		3.20	(16) OCC	59.15	141.48
	Sus. + E4{1}	19648	11344		3.20	(16) OCC	59.15	141.48
	Sus. + W1{1}	19648	3017		3.20	(16) OCC	51.59	141.48
	Sus. + W2{1}	19648	3017		3.20	(16) OCC	51.59	141.48
	Sus. + W3{1}	19648	2798		3.20	(16) OCC	51.39	141.48
	Sus. + W4{1}	19648	2798		3.20	(16) OCC	51.39	141.48
A04 N+	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	19987			3.20	(15) SUST	49.15	117.90
	TR:Amb to T1{1}			52160	3.20	(17) DISP	63.17	176.85
	Amb to T1{1}			52160	3.20	(17) DISP	63.17	176.85
	Sus. + E1{1}	19987	17163		3.20	(16) OCC	64.74	141.48
	Sus. + E2{1}	19987	17163		3.20	(16) OCC	64.74	141.48
	Sus. + E3{1}	19987	8856		3.20	(16) OCC	57.20	141.48
	Sus. + E4{1}	19987	8856		3.20	(16) OCC	57.20	141.48
	Sus. + W1{1}	19987	5179		3.20	(16) OCC	53.86	141.48
	Sus. + W2{1}	19987	5179		3.20	(16) OCC	53.86	141.48
	Sus. + W3{1}	19987	2112		3.20	(16) OCC	51.07	141.48
	Sus. + W4{1}	19987	2112		3.20	(16) OCC	51.07	141.48
A04 N-	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	19987			1.00	(15) SUST	38.57	117.90
	TR:Amb to T1{1}			52160	1.00	(17) DISP	19.77	176.85
	Amb to T1{1}			52160	1.00	(17) DISP	19.77	176.85
	Sus. + E1{1}	19987	17163		1.00	(16) OCC	45.08	141.48
	Sus. + E2{1}	19987	17163		1.00	(16) OCC	45.08	141.48
	Sus. + E3{1}	19987	8856		1.00	(16) OCC	41.93	141.48
	Sus. + E4{1}	19987	8856		1.00	(16) OCC	41.93	141.48
	Sus. + W1{1}	19987	5179		1.00	(16) OCC	40.54	141.48
	Sus. + W2{1}	19987	5179		1.00	(16) OCC	40.54	141.48
	Sus. + W3{1}	19987	2112		1.00	(16) OCC	39.37	141.48
	Sus. + W4{1}	19987	2112		1.00	(16) OCC	39.37	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )			S.I.F			
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				

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A03 +	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	52304				1.00	(15) SUST	50.82	117.90
	TR:Amb to T1{1}			44115		1.00	(17) DISP	16.72	176.85
	Amb to T1{1}			44115		1.00	(17) DISP	16.72	176.85
	Sus. + E1{1}	52304	23027			1.00	(16) OCC	59.55	141.48
	Sus. + E2{1}	52304	23027			1.00	(16) OCC	59.55	141.48
	Sus. + E3{1}	52304	26749			1.00	(16) OCC	60.96	141.48
	Sus. + E4{1}	52304	26749			1.00	(16) OCC	60.96	141.48
	Sus. + W1{1}	52304	6098			1.00	(16) OCC	53.13	141.48
	Sus. + W2{1}	52304	6098			1.00	(16) OCC	53.13	141.48
	Sus. + W3{1}	52304	6861			1.00	(16) OCC	53.42	141.48
	Sus. + W4{1}	52304	6861			1.00	(16) OCC	53.42	141.48
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A03 -	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	52304				1.00	(15) SUST	50.82	117.90
	TR:Amb to T1{1}			44115		1.00	(17) DISP	16.72	176.85
	Amb to T1{1}			44115		1.00	(17) DISP	16.72	176.85
	Sus. + E1{1}	52304	23027			1.00	(16) OCC	59.55	141.48
	Sus. + E2{1}	52304	23027			1.00	(16) OCC	59.55	141.48
	Sus. + E3{1}	52304	26749			1.00	(16) OCC	60.96	141.48
	Sus. + E4{1}	52304	26749			1.00	(16) OCC	60.96	141.48
	Sus. + W1{1}	52304	6098			1.00	(16) OCC	53.13	141.48
	Sus. + W2{1}	52304	6098			1.00	(16) OCC	53.13	141.48
	Sus. + W3{1}	52304	6861			1.00	(16) OCC	53.42	141.48
	Sus. + W4{1}	52304	6861			1.00	(16) OCC	53.42	141.48
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A02 F+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	30536				1.00	(15) SUST	42.57	117.90
	TR:Amb to T1{1}			57315		1.00	(17) DISP	21.72	176.85
	Amb to T1{1}			57315		1.00	(17) DISP	21.72	176.85
	Sus. + E1{1}	30536	24130			1.00	(16) OCC	51.71	141.48
	Sus. + E2{1}	30536	24130			1.00	(16) OCC	51.71	141.48
	Sus. + E3{1}	30536	17886			1.00	(16) OCC	49.35	141.48
	Sus. + E4{1}	30536	17886			1.00	(16) OCC	49.35	141.48
	Sus. + W1{1}	30536	6032			1.00	(16) OCC	44.86	141.48
	Sus. + W2{1}	30536	6032			1.00	(16) OCC	44.86	141.48
	Sus. + W3{1}	30536	4231			1.00	(16) OCC	44.17	141.48
	Sus. + W4{1}	30536	4231			1.00	(16) OCC	44.17	141.48
-----									
A02 F-	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	30536				3.20	(15) SUST	58.74	117.90
	TR:Amb to T1{1}			57315		3.20	(17) DISP	69.41	176.85
	Amb to T1{1}			57315		3.20	(17) DISP	69.41	176.85
	Sus. + E1{1}	30536	24130			3.20	(16) OCC	80.65	141.48
	Sus. + E2{1}	30536	24130			3.20	(16) OCC	80.65	141.48
	Sus. + E3{1}	30536	17886			3.20	(16) OCC	74.98	141.48
	Sus. + E4{1}	30536	17886			3.20	(16) OCC	74.98	141.48
	Sus. + W1{1}	30536	6032			3.20	(16) OCC	64.21	141.48
	Sus. + W2{1}	30536	6032			3.20	(16) OCC	64.21	141.48
	Sus. + W3{1}	30536	4231			3.20	(16) OCC	62.58	141.48
	Sus. + W4{1}	30536	4231			3.20	(16) OCC	62.58	141.48

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-----									
ASME B31.1 (2014) CODE COMPLIANCE									
(Moments in N.m ) (Stress in N/mm2 )									
Point	Load	Ma	Mb	Mc	S.I.F	Eq. Load	Code	Code	
name	combination	(Sus.)	(Occ.)	(Exp.)		no. type	Stress	Allow.	
-----									
A02 N+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	14571				3.20	(15) SUST	44.23	117.90
	TR:Amb to T1{1}			64194		3.20	(17) DISP	77.75	176.85
	Amb to T1{1}			64194		3.20	(17) DISP	77.75	176.85
	Sus. + E1{1}	14571	12919			3.20	(16) OCC	55.97	141.48
	Sus. + E2{1}	14571	12919			3.20	(16) OCC	55.97	141.48
	Sus. + E3{1}	14571	10833			3.20	(16) OCC	54.07	141.48
	Sus. + E4{1}	14571	10833			3.20	(16) OCC	54.07	141.48
	Sus. + W1{1}	14571	3050			3.20	(16) OCC	47.00	141.48
	Sus. + W2{1}	14571	3050			3.20	(16) OCC	47.00	141.48
	Sus. + W3{1}	14571	2329			3.20	(16) OCC	46.35	141.48
	Sus. + W4{1}	14571	2329			3.20	(16) OCC	46.35	141.48
-----									
A02 N-	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	14571				1.00	(15) SUST	36.52	117.90
	TR:Amb to T1{1}			64194		1.00	(17) DISP	24.33	176.85

	Amb to T1{1}			64194	1.00	(17)	DISP	24.33	176.85
	Sus. + E1{1}	14571	12919		1.00	(16)	OCC	41.42	141.48
	Sus. + E2{1}	14571	12919		1.00	(16)	OCC	41.42	141.48
	Sus. + E3{1}	14571	10833		1.00	(16)	OCC	40.63	141.48
	Sus. + E4{1}	14571	10833		1.00	(16)	OCC	40.63	141.48
	Sus. + W1{1}	14571	3050		1.00	(16)	OCC	37.68	141.48
	Sus. + W2{1}	14571	3050		1.00	(16)	OCC	37.68	141.48
	Sus. + W3{1}	14571	2329		1.00	(16)	OCC	37.40	141.48
	Sus. + W4{1}	14571	2329		1.00	(16)	OCC	37.40	141.48
A01	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	12345			1.00	(15)	SUST	35.68	117.90
	TR:Amb to T1{1}			62733	1.00	(17)	DISP	23.77	176.85
	Amb to T1{1}			62733	1.00	(17)	DISP	23.77	176.85
	Sus. + E1{1}	12345	5372		1.00	(16)	OCC	37.71	141.48
	Sus. + E2{1}	12345	5372		1.00	(16)	OCC	37.71	141.48
	Sus. + E3{1}	12345	10296		1.00	(16)	OCC	39.58	141.48
	Sus. + E4{1}	12345	10296		1.00	(16)	OCC	39.58	141.48
	Sus. + W1{1}	12345	893		1.00	(16)	OCC	36.02	141.48
	Sus. + W2{1}	12345	893		1.00	(16)	OCC	36.02	141.48
	Sus. + W3{1}	12345	2203		1.00	(16)	OCC	36.51	141.48
	Sus. + W4{1}	12345	2203		1.00	(16)	OCC	36.51	141.48

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R E S U L T S U M M A R Y

Maximum sustained stress ratio

Point : A07 F  
Stress N/mm2 : 120.28  
Allowable N/mm2 : 117.90  
Ratio : 1.02  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A06 N  
Stress N/mm2 : 123.19  
Allowable N/mm2 : 176.85  
Ratio : 0.70  
Load combination : Max Range

Maximum occasional stress ratio

Point : A07 F  
Stress N/mm2 : 139.16  
Allowable N/mm2 : 141.48  
Ratio : 0.98  
Load combination : Sus. + E3{1}

Maximum hoop stress ratio

Point : A07 F  
Stress N/mm2 : 91.29  
Allowable N/mm2 : 117.90  
Ratio : 0.77  
Load combination : Max P{1}

\* \* \*

## **LAMPIRAN H**

*GENERAL PIPE STRESS REPORT (HYDROTEST CONDITION  
WITHOUT EXPANSION JOINT, PIPE THICKNESS = 7,989 mm)*



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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A02 N+	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	19328			3.20	(15) SUST	48.56	117.90
	TR:Amb to T1{1}			179294	3.20	(17) DISP	217.14	176.85**
	with Sus. load margin						217.14	246.19
	Amb to T1{1}			179294	3.20	(17) DISP	217.14	176.85**
	with Sus. load margin						217.14	246.19
	Sus. + E1{1}	19328	8726		3.20	(16) OCC	56.48	141.48
	Sus. + E2{1}	19328	8726		3.20	(16) OCC	56.48	141.48
	Sus. + E3{1}	19328	10787		3.20	(16) OCC	58.35	141.48
	Sus. + E4{1}	19328	10787		3.20	(16) OCC	58.35	141.48
	Sus. + W1{1}	19328	2485		3.20	(16) OCC	50.81	141.48
	Sus. + W2{1}	19328	2485		3.20	(16) OCC	50.81	141.48
	Sus. + W3{1}	19328	2652		3.20	(16) OCC	50.96	141.48
	Sus. + W4{1}	19328	2652		3.20	(16) OCC	50.96	141.48
A02 F-	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	27399			3.20	(15) SUST	55.89	117.90
	TR:Amb to T1{1}			171224	3.20	(17) DISP	207.37	176.85**
	with Sus. load margin						207.37	238.86
	Amb to T1{1}			171224	3.20	(17) DISP	207.37	176.85**
	with Sus. load margin						207.37	238.86
	Sus. + E1{1}	27399	6856		3.20	(16) OCC	62.11	141.48
	Sus. + E2{1}	27399	6856		3.20	(16) OCC	62.11	141.48
	Sus. + E3{1}	27399	11242		3.20	(16) OCC	66.10	141.48
	Sus. + E4{1}	27399	11242		3.20	(16) OCC	66.10	141.48
	Sus. + W1{1}	27399	2209		3.20	(16) OCC	57.89	141.48
	Sus. + W2{1}	27399	2209		3.20	(16) OCC	57.89	141.48
	Sus. + W3{1}	27399	2816		3.20	(16) OCC	58.44	141.48
	Sus. + W4{1}	27399	2816		3.20	(16) OCC	58.44	141.48
A04 N+	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	26092			3.20	(15) SUST	54.70	117.90
	TR:Amb to T1{1}			133610	3.20	(17) DISP	161.82	176.85
	Amb to T1{1}			133610	3.20	(17) DISP	161.82	176.85
	Sus. + E1{1}	26092	15488		3.20	(16) OCC	68.77	141.48
	Sus. + E2{1}	26092	15488		3.20	(16) OCC	68.77	141.48
	Sus. + E3{1}	26092	7016		3.20	(16) OCC	61.07	141.48
	Sus. + E4{1}	26092	7016		3.20	(16) OCC	61.07	141.48
	Sus. + W1{1}	26092	5460		3.20	(16) OCC	59.66	141.48
	Sus. + W2{1}	26092	5460		3.20	(16) OCC	59.66	141.48
	Sus. + W3{1}	26092	1631		3.20	(16) OCC	56.18	141.48
	Sus. + W4{1}	26092	1631		3.20	(16) OCC	56.18	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A05 F-	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	12003			3.20	(15) SUST	41.90	117.90
	TR:Amb to T1{1}			125030	3.20	(17) DISP	151.42	176.85
	Amb to T1{1}			125030	3.20	(17) DISP	151.42	176.85
	Sus. + E1{1}	12003	10761		3.20	(16) OCC	51.68	141.48
	Sus. + E2{1}	12003	10761		3.20	(16) OCC	51.68	141.48
	Sus. + E3{1}	12003	2755		3.20	(16) OCC	44.40	141.48
	Sus. + E4{1}	12003	2755		3.20	(16) OCC	44.40	141.48
	Sus. + W1{1}	12003	3847		3.20	(16) OCC	45.40	141.48
	Sus. + W2{1}	12003	3847		3.20	(16) OCC	45.40	141.48

	Sus. + W3{1}	12003	779		3.20	(16)	OCC	42.61	141.48
	Sus. + W4{1}	12003	779		3.20	(16)	OCC	42.61	141.48
A05 N+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	8860			3.20	(15)	SUST	39.05	117.90
	TR:Amb to T1{1}			107151	3.20	(17)	DISP	129.77	176.85
	Amb to T1{1}			107151	3.20	(17)	DISP	129.77	176.85
	Sus. + E1{1}	8860	6883		3.20	(16)	OCC	45.30	141.48
	Sus. + E2{1}	8860	6883		3.20	(16)	OCC	45.30	141.48
	Sus. + E3{1}	8860	6097		3.20	(16)	OCC	44.59	141.48
	Sus. + E4{1}	8860	6097		3.20	(16)	OCC	44.59	141.48
	Sus. + W1{1}	8860	2383		3.20	(16)	OCC	41.21	141.48
	Sus. + W2{1}	8860	2383		3.20	(16)	OCC	41.21	141.48
	Sus. + W3{1}	8860	2089		3.20	(16)	OCC	40.95	141.48
	Sus. + W4{1}	8860	2089		3.20	(16)	OCC	40.95	141.48
A06 F-	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	35795			6.89	(15)	SUST	101.10	117.90
	TR:Amb to T1{1}			46582	6.89	(17)	DISP	121.64	176.85
	Amb to T1{1}			46582	6.89	(17)	DISP	121.64	176.85
	Sus. + E1{1}	35795	11934		6.89	(16)	OCC	124.48	141.48
	Sus. + E2{1}	35795	11934		6.89	(16)	OCC	124.48	141.48
	Sus. + E3{1}	35795	9903		6.89	(16)	OCC	120.50	141.48
	Sus. + E4{1}	35795	9903		6.89	(16)	OCC	120.50	141.48
	Sus. + W1{1}	35795	4035		6.89	(16)	OCC	109.00	141.48
	Sus. + W2{1}	35795	4035		6.89	(16)	OCC	109.00	141.48
	Sus. + W3{1}	35795	3370		6.89	(16)	OCC	107.70	141.48
	Sus. + W4{1}	35795	3370		6.89	(16)	OCC	107.70	141.48
A06 N+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	35612			6.89	(15)	SUST	100.74	117.90
	TR:Amb to T1{1}			46484	6.89	(17)	DISP	121.38	176.85
	Amb to T1{1}			46484	6.89	(17)	DISP	121.38	176.85
	Sus. + E1{1}	35612	11953		6.89	(16)	OCC	124.15	141.48
	Sus. + E2{1}	35612	11953		6.89	(16)	OCC	124.15	141.48
	Sus. + E3{1}	35612	9518		6.89	(16)	OCC	119.39	141.48
	Sus. + E4{1}	35612	9518		6.89	(16)	OCC	119.39	141.48
	Sus. + W1{1}	35612	4107		6.89	(16)	OCC	108.79	141.48
	Sus. + W2{1}	35612	4107		6.89	(16)	OCC	108.79	141.48
	Sus. + W3{1}	35612	3256		6.89	(16)	OCC	107.12	141.48
	Sus. + W4{1}	35612	3256		6.89	(16)	OCC	107.12	141.48

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ASME B31.1 (2014) CODE COMPLIANCE										
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.	
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type			
A07 F-	Max P{1}						( 3)	HOOP	91.29	117.90
	GR + Max P{1}	33180					6.89	(15) SUST	95.98	117.90
	TR:Amb to T1{1}			31579			6.89	(17) DISP	82.46	176.85
	Amb to T1{1}			31579			6.89	(17) DISP	82.46	176.85
	Sus. + E1{1}	33180	3978				6.89	(16) OCC	103.77	141.48
	Sus. + E2{1}	33180	3978				6.89	(16) OCC	103.77	141.48
	Sus. + E3{1}	33180	6090				6.89	(16) OCC	107.91	141.48
	Sus. + E4{1}	33180	6090				6.89	(16) OCC	107.91	141.48
	Sus. + W1{1}	33180	2330				6.89	(16) OCC	100.54	141.48
	Sus. + W2{1}	33180	2330				6.89	(16) OCC	100.54	141.48
	Sus. + W3{1}	33180	1880				6.89	(16) OCC	99.66	141.48
	Sus. + W4{1}	33180	1880				6.89	(16) OCC	99.66	141.48
A07 N+	Max P{1}						( 3)	HOOP	91.29	117.90
	GR + Max P{1}	31120					6.89	(15) SUST	91.95	117.90
	TR:Amb to T1{1}			34222			6.89	(17) DISP	89.36	176.85
	Amb to T1{1}			34222			6.89	(17) DISP	89.36	176.85
	Sus. + E1{1}	31120	3836				6.89	(16) OCC	99.46	141.48
	Sus. + E2{1}	31120	3836				6.89	(16) OCC	99.46	141.48
	Sus. + E3{1}	31120	6856				6.89	(16) OCC	105.37	141.48
	Sus. + E4{1}	31120	6856				6.89	(16) OCC	105.37	141.48
	Sus. + W1{1}	31120	1698				6.89	(16) OCC	95.27	141.48
	Sus. + W2{1}	31120	1698				6.89	(16) OCC	95.27	141.48
	Sus. + W3{1}	31120	2122				6.89	(16) OCC	96.10	141.48
	Sus. + W4{1}	31120	2122				6.89	(16) OCC	96.10	141.48
A09 N+	Max P{1}						( 3)	HOOP	91.29	117.90

GR + Max P{1}	33693		3.20	(15)	SUST	61.60	117.90	
TR:Amb to T1{1}			85267	3.20	(17)	DISP	103.27 176.85	
Amb to T1{1}			85267	3.20	(17)	DISP	103.27 176.85	
Sus. + E1{1}	33693	3956		3.20	(16)	OCC	65.20 141.48	
Sus. + E2{1}	33693	3956		3.20	(16)	OCC	65.20 141.48	
Sus. + E3{1}	33693	2646		3.20	(16)	OCC	64.01 141.48	
Sus. + E4{1}	33693	2646		3.20	(16)	OCC	64.01 141.48	
Sus. + W1{1}	33693	845		3.20	(16)	OCC	62.37 141.48	
Sus. + W2{1}	33693	845		3.20	(16)	OCC	62.37 141.48	
Sus. + W3{1}	33693	946		3.20	(16)	OCC	62.46 141.48	
Sus. + W4{1}	33693	946		3.20	(16)	OCC	62.46 141.48	
A03 + Max P{1}						( 3)	HOOP	91.29 117.90
GR + Max P{1}	69657			1.00	(15)	SUST	57.40 117.90	
TR:Amb to T1{1}				255940	1.00	(17)	DISP	96.99 176.85
Amb to T1{1}				255940	1.00	(17)	DISP	96.99 176.85
Sus. + E1{1}	69657	13872		1.00	(16)	OCC	62.65 141.48	
Sus. + E2{1}	69657	13872		1.00	(16)	OCC	62.65 141.48	
Sus. + E3{1}	69657	33002		1.00	(16)	OCC	69.90 141.48	
Sus. + E4{1}	69657	33002		1.00	(16)	OCC	69.90 141.48	
Sus. + W1{1}	69657	4959		1.00	(16)	OCC	59.28 141.48	
Sus. + W2{1}	69657	4959		1.00	(16)	OCC	59.28 141.48	
Sus. + W3{1}	69657	8513		1.00	(16)	OCC	60.62 141.48	
Sus. + W4{1}	69657	8513		1.00	(16)	OCC	60.62 141.48	

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Moments in N.m )		(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type			
-----										
A03	- Max P{1}						( 3)	HOOP	91.29	117.90
	GR + Max P{1}	69657				1.00	(15)	SUST	57.40	117.90
	TR:Amb to T1{1}				255940	1.00	(17)	DISP	96.99	176.85
	Amb to T1{1}				255940	1.00	(17)	DISP	96.99	176.85
	Sus. + E1{1}	69657	13872			1.00	(16)	OCC	62.65	141.48
	Sus. + E2{1}	69657	13872			1.00	(16)	OCC	62.65	141.48
	Sus. + E3{1}	69657	33002			1.00	(16)	OCC	69.90	141.48
	Sus. + E4{1}	69657	33002			1.00	(16)	OCC	69.90	141.48
	Sus. + W1{1}	69657	4959			1.00	(16)	OCC	59.28	141.48
	Sus. + W2{1}	69657	4959			1.00	(16)	OCC	59.28	141.48
	Sus. + W3{1}	69657	8513			1.00	(16)	OCC	60.62	141.48
	Sus. + W4{1}	69657	8513			1.00	(16)	OCC	60.62	141.48
-----										
A10	+ Max P{1}						( 3)	HOOP	91.29	117.90
	GR + Max P{1}	168498				1.00	(15)	SUST	94.85	117.90
	TR:Amb to T1{1}				16827	1.00	(17)	DISP	6.38	176.85
	Amb to T1{1}				16827	1.00	(17)	DISP	6.38	176.85
	Sus. + E1{1}	168498	1048			1.00	(16)	OCC	95.25	141.48
	Sus. + E2{1}	168498	1048			1.00	(16)	OCC	95.25	141.48
	Sus. + E3{1}	168498	2668			1.00	(16)	OCC	95.86	141.48
	Sus. + E4{1}	168498	2668			1.00	(16)	OCC	95.86	141.48
	Sus. + W1{1}	168498	1636			1.00	(16)	OCC	95.47	141.48
	Sus. + W2{1}	168498	1636			1.00	(16)	OCC	95.47	141.48
	Sus. + W3{1}	168498	915			1.00	(16)	OCC	95.20	141.48
	Sus. + W4{1}	168498	915			1.00	(16)	OCC	95.20	141.48
-----										
A10	- Max P{1}						( 3)	HOOP	91.29	117.90
	GR + Max P{1}	168498				1.00	(15)	SUST	94.85	117.90
	TR:Amb to T1{1}				16827	1.00	(17)	DISP	6.38	176.85
	Amb to T1{1}				16827	1.00	(17)	DISP	6.38	176.85
	Sus. + E1{1}	168498	1048			1.00	(16)	OCC	95.25	141.48
	Sus. + E2{1}	168498	1048			1.00	(16)	OCC	95.25	141.48
	Sus. + E3{1}	168498	2668			1.00	(16)	OCC	95.86	141.48
	Sus. + E4{1}	168498	2668			1.00	(16)	OCC	95.86	141.48
	Sus. + W1{1}	168498	1636			1.00	(16)	OCC	95.47	141.48
	Sus. + W2{1}	168498	1636			1.00	(16)	OCC	95.47	141.48
	Sus. + W3{1}	168498	915			1.00	(16)	OCC	95.20	141.48
	Sus. + W4{1}	168498	915			1.00	(16)	OCC	95.20	141.48
-----										
A08	+ Max P{1}						( 3)	HOOP	91.29	117.90
	GR + Max P{1}	26002				1.00	(15)	SUST	40.85	117.90
	TR:Amb to T1{1}				248757	1.00	(17)	DISP	94.27	176.85
	Amb to T1{1}				248757	1.00	(17)	DISP	94.27	176.85
	Sus. + E1{1}	26002	50639			1.00	(16)	OCC	60.04	141.48

Sus. + E2{1}	26002	50639	1.00	(16)	OCC	60.04	141.48
Sus. + E3{1}	26002	32527	1.00	(16)	OCC	53.18	141.48
Sus. + E4{1}	26002	32527	1.00	(16)	OCC	53.18	141.48
Sus. + W1{1}	26002	22906	1.00	(16)	OCC	49.53	141.48
Sus. + W2{1}	26002	22906	1.00	(16)	OCC	49.53	141.48
Sus. + W3{1}	26002	11141	1.00	(16)	OCC	45.07	141.48
Sus. + W4{1}	26002	11141	1.00	(16)	OCC	45.07	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )					
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A08 -	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	26002			1.00	(15) SUST	40.85	117.90
	TR:Amb to Tl{1}			248757	1.00	(17) DISP	94.27	176.85
	Amb to Tl{1}			248757	1.00	(17) DISP	94.27	176.85
	Sus. + E1{1}	26002	50639		1.00	(16) OCC	60.04	141.48
	Sus. + E2{1}	26002	50639		1.00	(16) OCC	60.04	141.48
	Sus. + E3{1}	26002	32527		1.00	(16) OCC	53.18	141.48
	Sus. + E4{1}	26002	32527		1.00	(16) OCC	53.18	141.48
	Sus. + W1{1}	26002	22906		1.00	(16) OCC	49.53	141.48
	Sus. + W2{1}	26002	22906		1.00	(16) OCC	49.53	141.48
	Sus. + W3{1}	26002	11141		1.00	(16) OCC	45.07	141.48
	Sus. + W4{1}	26002	11141		1.00	(16) OCC	45.07	141.48
A15	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	7936			1.00	(15) SUST	34.01	117.90
	TR:Amb to Tl{1}			9725	1.00	(17) DISP	3.69	176.85
	Amb to Tl{1}			9725	1.00	(17) DISP	3.69	176.85
	Sus. + E1{1}	7936	30938		1.00	(16) OCC	45.73	141.48
	Sus. + E2{1}	7936	30938		1.00	(16) OCC	45.73	141.48
	Sus. + E3{1}	7936	30459		1.00	(16) OCC	45.55	141.48
	Sus. + E4{1}	7936	30459		1.00	(16) OCC	45.55	141.48
	Sus. + W1{1}	7936	17556		1.00	(16) OCC	40.66	141.48
	Sus. + W2{1}	7936	17556		1.00	(16) OCC	40.66	141.48
	Sus. + W3{1}	7936	13730		1.00	(16) OCC	39.21	141.48
	Sus. + W4{1}	7936	13730		1.00	(16) OCC	39.21	141.48
A14 F+	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	12549			1.00	(15) SUST	35.75	117.90
	TR:Amb to Tl{1}			21284	1.00	(17) DISP	8.07	176.85
	Amb to Tl{1}			21284	1.00	(17) DISP	8.07	176.85
	Sus. + E1{1}	12549	13912		1.00	(16) OCC	41.03	141.48
	Sus. + E2{1}	12549	13912		1.00	(16) OCC	41.03	141.48
	Sus. + E3{1}	12549	6908		1.00	(16) OCC	38.37	141.48
	Sus. + E4{1}	12549	6908		1.00	(16) OCC	38.37	141.48
	Sus. + W1{1}	12549	6975		1.00	(16) OCC	38.40	141.48
	Sus. + W2{1}	12549	6975		1.00	(16) OCC	38.40	141.48
	Sus. + W3{1}	12549	3308		1.00	(16) OCC	37.01	141.48
	Sus. + W4{1}	12549	3308		1.00	(16) OCC	37.01	141.48
A14 F-	Max P{1}					( 3) HOOP	91.29	117.90
	GR + Max P{1}	12549			3.20	(15) SUST	42.40	117.90
	TR:Amb to Tl{1}			21284	3.20	(17) DISP	25.78	176.85
	Amb to Tl{1}			21284	3.20	(17) DISP	25.78	176.85
	Sus. + E1{1}	12549	13912		3.20	(16) OCC	55.03	141.48
	Sus. + E2{1}	12549	13912		3.20	(16) OCC	55.03	141.48
	Sus. + E3{1}	12549	6908		3.20	(16) OCC	48.67	141.48
	Sus. + E4{1}	12549	6908		3.20	(16) OCC	48.67	141.48
	Sus. + W1{1}	12549	6975		3.20	(16) OCC	48.73	141.48
	Sus. + W2{1}	12549	6975		3.20	(16) OCC	48.73	141.48
	Sus. + W3{1}	12549	3308		3.20	(16) OCC	45.40	141.48
	Sus. + W4{1}	12549	3308		3.20	(16) OCC	45.40	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Load type		
A14 N+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	5009			3.20	(15)	SUST	35.55	117.90
	TR:Amb to T1{1}			13120	3.20	(17)	DISP	15.89	176.85
	Amb to T1{1}			13120	3.20	(17)	DISP	15.89	176.85
	Sus. + E1{1}	5009	10462		3.20	(16)	OCC	45.05	141.48
	Sus. + E2{1}	5009	10462		3.20	(16)	OCC	45.05	141.48
	Sus. + E3{1}	5009	5733		3.20	(16)	OCC	40.76	141.48
	Sus. + E4{1}	5009	5733		3.20	(16)	OCC	40.76	141.48
	Sus. + W1{1}	5009	4848		3.20	(16)	OCC	39.95	141.48
	Sus. + W2{1}	5009	4848		3.20	(16)	OCC	39.95	141.48
	Sus. + W3{1}	5009	2857		3.20	(16)	OCC	38.14	141.48
	Sus. + W4{1}	5009	2857		3.20	(16)	OCC	38.14	141.48
A14 N-	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	5009			1.00	(15)	SUST	32.90	117.90
	TR:Amb to T1{1}			13120	1.00	(17)	DISP	4.97	176.85
	Amb to T1{1}			13120	1.00	(17)	DISP	4.97	176.85
	Sus. + E1{1}	5009	10462		1.00	(16)	OCC	36.86	141.48
	Sus. + E2{1}	5009	10462		1.00	(16)	OCC	36.86	141.48
	Sus. + E3{1}	5009	5733		1.00	(16)	OCC	35.07	141.48
	Sus. + E4{1}	5009	5733		1.00	(16)	OCC	35.07	141.48
	Sus. + W1{1}	5009	4848		1.00	(16)	OCC	34.73	141.48
	Sus. + W2{1}	5009	4848		1.00	(16)	OCC	34.73	141.48
	Sus. + W3{1}	5009	2857		1.00	(16)	OCC	33.98	141.48
	Sus. + W4{1}	5009	2857		1.00	(16)	OCC	33.98	141.48
A13 F+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	13814			1.00	(15)	SUST	36.23	117.90
	TR:Amb to T1{1}			33300	1.00	(17)	DISP	12.62	176.85
	Amb to T1{1}			33300	1.00	(17)	DISP	12.62	176.85
	Sus. + E1{1}	13814	7988		1.00	(16)	OCC	39.26	141.48
	Sus. + E2{1}	13814	7988		1.00	(16)	OCC	39.26	141.48
	Sus. + E3{1}	13814	3649		1.00	(16)	OCC	37.62	141.48
	Sus. + E4{1}	13814	3649		1.00	(16)	OCC	37.62	141.48
	Sus. + W1{1}	13814	4623		1.00	(16)	OCC	37.99	141.48
	Sus. + W2{1}	13814	4623		1.00	(16)	OCC	37.99	141.48
	Sus. + W3{1}	13814	1659		1.00	(16)	OCC	36.86	141.48
	Sus. + W4{1}	13814	1659		1.00	(16)	OCC	36.86	141.48
A13 F-	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	13814			3.20	(15)	SUST	43.55	117.90
	TR:Amb to T1{1}			33300	3.20	(17)	DISP	40.33	176.85
	Amb to T1{1}			33300	3.20	(17)	DISP	40.33	176.85
	Sus. + E1{1}	13814	7988		3.20	(16)	OCC	50.80	141.48
	Sus. + E2{1}	13814	7988		3.20	(16)	OCC	50.80	141.48
	Sus. + E3{1}	13814	3649		3.20	(16)	OCC	46.86	141.48
	Sus. + E4{1}	13814	3649		3.20	(16)	OCC	46.86	141.48
	Sus. + W1{1}	13814	4623		3.20	(16)	OCC	47.75	141.48
	Sus. + W2{1}	13814	4623		3.20	(16)	OCC	47.75	141.48
	Sus. + W3{1}	13814	1659		3.20	(16)	OCC	45.05	141.48
	Sus. + W4{1}	13814	1659		3.20	(16)	OCC	45.05	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Load type		
A13 N+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	6536			3.20	(15)	SUST	36.94	117.90
	TR:Amb to T1{1}			41471	3.20	(17)	DISP	50.23	176.85
	Amb to T1{1}			41471	3.20	(17)	DISP	50.23	176.85
	Sus. + E1{1}	6536	10406		3.20	(16)	OCC	46.39	141.48
	Sus. + E2{1}	6536	10406		3.20	(16)	OCC	46.39	141.48
	Sus. + E3{1}	6536	4521		3.20	(16)	OCC	41.04	141.48
	Sus. + E4{1}	6536	4521		3.20	(16)	OCC	41.04	141.48
	Sus. + W1{1}	6536	6153		3.20	(16)	OCC	42.52	141.48
	Sus. + W2{1}	6536	6153		3.20	(16)	OCC	42.52	141.48
	Sus. + W3{1}	6536	2284		3.20	(16)	OCC	39.01	141.48

	Sus. + W4{1}	6536	2284		3.20	(16)	OCC	39.01	141.48
A13 N-	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	6536			1.00	(15)	SUST	33.48	117.90
	TR:Amb to T1{1}			41471	1.00	(17)	DISP	15.72	176.85
	Amb to T1{1}			41471	1.00	(17)	DISP	15.72	176.85
	Sus. + E1{1}	6536	10406		1.00	(16)	OCC	37.42	141.48
	Sus. + E2{1}	6536	10406		1.00	(16)	OCC	37.42	141.48
	Sus. + E3{1}	6536	4521		1.00	(16)	OCC	35.19	141.48
	Sus. + E4{1}	6536	4521		1.00	(16)	OCC	35.19	141.48
	Sus. + W1{1}	6536	6153		1.00	(16)	OCC	35.81	141.48
	Sus. + W2{1}	6536	6153		1.00	(16)	OCC	35.81	141.48
	Sus. + W3{1}	6536	2284		1.00	(16)	OCC	34.34	141.48
	Sus. + W4{1}	6536	2284		1.00	(16)	OCC	34.34	141.48
A12 +	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	29237			1.00	(15)	SUST	42.08	117.90
	TR:Amb to T1{1}			17950	1.00	(17)	DISP	6.80	176.85
	Amb to T1{1}			17950	1.00	(17)	DISP	6.80	176.85
	Sus. + E1{1}	29237	6670		1.00	(16)	OCC	44.61	141.48
	Sus. + E2{1}	29237	6670		1.00	(16)	OCC	44.61	141.48
	Sus. + E3{1}	29237	7870		1.00	(16)	OCC	45.06	141.48
	Sus. + E4{1}	29237	7870		1.00	(16)	OCC	45.06	141.48
	Sus. + W1{1}	29237	4668		1.00	(16)	OCC	43.85	141.48
	Sus. + W2{1}	29237	4668		1.00	(16)	OCC	43.85	141.48
	Sus. + W3{1}	29237	2703		1.00	(16)	OCC	43.10	141.48
	Sus. + W4{1}	29237	2703		1.00	(16)	OCC	43.10	141.48
A12 -	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	29237			1.00	(15)	SUST	42.08	117.90
	TR:Amb to T1{1}			17950	1.00	(17)	DISP	6.80	176.85
	Amb to T1{1}			17950	1.00	(17)	DISP	6.80	176.85
	Sus. + E1{1}	29237	6670		1.00	(16)	OCC	44.61	141.48
	Sus. + E2{1}	29237	6670		1.00	(16)	OCC	44.61	141.48
	Sus. + E3{1}	29237	7870		1.00	(16)	OCC	45.06	141.48
	Sus. + E4{1}	29237	7870		1.00	(16)	OCC	45.06	141.48
	Sus. + W1{1}	29237	4668		1.00	(16)	OCC	43.85	141.48
	Sus. + W2{1}	29237	4668		1.00	(16)	OCC	43.85	141.48
	Sus. + W3{1}	29237	2703		1.00	(16)	OCC	43.10	141.48
	Sus. + W4{1}	29237	2703		1.00	(16)	OCC	43.10	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type		
A11 F+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	28322			1.00	(15)	SUST	41.73	117.90
	TR:Amb to T1{1}			20246	1.00	(17)	DISP	7.67	176.85
	Amb to T1{1}			20246	1.00	(17)	DISP	7.67	176.85
	Sus. + E1{1}	28322	6453		1.00	(16)	OCC	44.18	141.48
	Sus. + E2{1}	28322	6453		1.00	(16)	OCC	44.18	141.48
	Sus. + E3{1}	28322	7178		1.00	(16)	OCC	44.45	141.48
	Sus. + E4{1}	28322	7178		1.00	(16)	OCC	44.45	141.48
	Sus. + W1{1}	28322	4574		1.00	(16)	OCC	43.47	141.48
	Sus. + W2{1}	28322	4574		1.00	(16)	OCC	43.47	141.48
	Sus. + W3{1}	28322	2546		1.00	(16)	OCC	42.70	141.48
	Sus. + W4{1}	28322	2546		1.00	(16)	OCC	42.70	141.48
A11 F-	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	28322			3.20	(15)	SUST	56.72	117.90
	TR:Amb to T1{1}			20246	3.20	(17)	DISP	24.52	176.85
	Amb to T1{1}			20246	3.20	(17)	DISP	24.52	176.85
	Sus. + E1{1}	28322	6453		3.20	(16)	OCC	62.59	141.48
	Sus. + E2{1}	28322	6453		3.20	(16)	OCC	62.59	141.48
	Sus. + E3{1}	28322	7178		3.20	(16)	OCC	63.24	141.48
	Sus. + E4{1}	28322	7178		3.20	(16)	OCC	63.24	141.48
	Sus. + W1{1}	28322	4574		3.20	(16)	OCC	60.88	141.48
	Sus. + W2{1}	28322	4574		3.20	(16)	OCC	60.88	141.48
	Sus. + W3{1}	28322	2546		3.20	(16)	OCC	59.04	141.48
	Sus. + W4{1}	28322	2546		3.20	(16)	OCC	59.04	141.48
A11 N+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	20505			3.20	(15)	SUST	49.62	117.90

TR:Amb to T1{1}			46926	3.20	(17)	DISP	56.83	176.85
Amb to T1{1}			46926	3.20	(17)	DISP	56.83	176.85
Sus. + E1{1}	20505	2854		3.20	(16)	OCC	52.22	141.48
Sus. + E2{1}	20505	2854		3.20	(16)	OCC	52.22	141.48
Sus. + E3{1}	20505	1570		3.20	(16)	OCC	51.05	141.48
Sus. + E4{1}	20505	1570		3.20	(16)	OCC	51.05	141.48
Sus. + W1{1}	20505	2523		3.20	(16)	OCC	51.92	141.48
Sus. + W2{1}	20505	2523		3.20	(16)	OCC	51.92	141.48
Sus. + W3{1}	20505	1013		3.20	(16)	OCC	50.54	141.48
Sus. + W4{1}	20505	1013		3.20	(16)	OCC	50.54	141.48
All N- Max P{1}					( 3)	HOOP	91.29	117.90
GR + Max P{1}	20505			1.00	(15)	SUST	38.77	117.90
TR:Amb to T1{1}			46926	1.00	(17)	DISP	17.78	176.85
Amb to T1{1}			46926	1.00	(17)	DISP	17.78	176.85
Sus. + E1{1}	20505	2854		1.00	(16)	OCC	39.85	141.48
Sus. + E2{1}	20505	2854		1.00	(16)	OCC	39.85	141.48
Sus. + E3{1}	20505	1570		1.00	(16)	OCC	39.36	141.48
Sus. + E4{1}	20505	1570		1.00	(16)	OCC	39.36	141.48
Sus. + W1{1}	20505	2523		1.00	(16)	OCC	39.73	141.48
Sus. + W2{1}	20505	2523		1.00	(16)	OCC	39.73	141.48
Sus. + W3{1}	20505	1013		1.00	(16)	OCC	39.15	141.48
Sus. + W4{1}	20505	1013		1.00	(16)	OCC	39.15	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
		(Moments in N.m )			(Stress in N/mm2 )				
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.	
A09 F+	Max P{1}					( 3) HOOP	91.29	117.90	
	GR + Max P{1}	60398			1.00	(15) SUST	53.89	117.90	
	TR:Amb to T1{1}			68605	1.00	(17) DISP	26.00	176.85	
	Amb to T1{1}			68605	1.00	(17) DISP	26.00	176.85	
	Sus. + E1{1}	60398	1860		1.00	(16) OCC	54.59	141.48	
	Sus. + E2{1}	60398	1860		1.00	(16) OCC	54.59	141.48	
	Sus. + E3{1}	60398	2743		1.00	(16) OCC	54.93	141.48	
	Sus. + E4{1}	60398	2743		1.00	(16) OCC	54.93	141.48	
	Sus. + W1{1}	60398	1693		1.00	(16) OCC	54.53	141.48	
	Sus. + W2{1}	60398	1693		1.00	(16) OCC	54.53	141.48	
	Sus. + W3{1}	60398	819		1.00	(16) OCC	54.20	141.48	
	Sus. + W4{1}	60398	819		1.00	(16) OCC	54.20	141.48	
A09 F-	Max P{1}					( 3) HOOP	91.29	117.90	
	GR + Max P{1}	60398			3.20	(15) SUST	85.86	117.90	
	TR:Amb to T1{1}			68605	3.20	(17) DISP	83.09	176.85	
	Amb to T1{1}			68605	3.20	(17) DISP	83.09	176.85	
	Sus. + E1{1}	60398	1860		3.20	(16) OCC	87.55	141.48	
	Sus. + E2{1}	60398	1860		3.20	(16) OCC	87.55	141.48	
	Sus. + E3{1}	60398	2743		3.20	(16) OCC	88.35	141.48	
	Sus. + E4{1}	60398	2743		3.20	(16) OCC	88.35	141.48	
	Sus. + W1{1}	60398	1693		3.20	(16) OCC	87.40	141.48	
	Sus. + W2{1}	60398	1693		3.20	(16) OCC	87.40	141.48	
	Sus. + W3{1}	60398	819		3.20	(16) OCC	86.60	141.48	
	Sus. + W4{1}	60398	819		3.20	(16) OCC	86.60	141.48	
A09 N-	Max P{1}					( 3) HOOP	91.29	117.90	
	GR + Max P{1}	33693			1.00	(15) SUST	43.77	117.90	
	TR:Amb to T1{1}			85267	1.00	(17) DISP	32.31	176.85	
	Amb to T1{1}			85267	1.00	(17) DISP	32.31	176.85	
	Sus. + E1{1}	33693	3956		1.00	(16) OCC	45.27	141.48	
	Sus. + E2{1}	33693	3956		1.00	(16) OCC	45.27	141.48	
	Sus. + E3{1}	33693	2646		1.00	(16) OCC	44.77	141.48	
	Sus. + E4{1}	33693	2646		1.00	(16) OCC	44.77	141.48	
	Sus. + W1{1}	33693	845		1.00	(16) OCC	44.09	141.48	
	Sus. + W2{1}	33693	845		1.00	(16) OCC	44.09	141.48	
	Sus. + W3{1}	33693	946		1.00	(16) OCC	44.13	141.48	
	Sus. + W4{1}	33693	946		1.00	(16) OCC	44.13	141.48	
A07 F+	Max P{1}					( 3) HOOP	91.29	117.90	
	GR + Max P{1}	33180			1.00	(15) SUST	43.57	117.90	
	TR:Amb to T1{1}			31579	1.00	(17) DISP	11.97	176.85	
	Amb to T1{1}			31579	1.00	(17) DISP	11.97	176.85	
	Sus. + E1{1}	33180	3978		1.00	(16) OCC	45.08	141.48	
	Sus. + E2{1}	33180	3978		1.00	(16) OCC	45.08	141.48	

Sus. + E3{1}	33180	6090	1.00	(16)	OCC	45.88	141.48
Sus. + E4{1}	33180	6090	1.00	(16)	OCC	45.88	141.48
Sus. + W1{1}	33180	2330	1.00	(16)	OCC	44.46	141.48
Sus. + W2{1}	33180	2330	1.00	(16)	OCC	44.46	141.48
Sus. + W3{1}	33180	1880	1.00	(16)	OCC	44.29	141.48
Sus. + W4{1}	33180	1880	1.00	(16)	OCC	44.29	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )					
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A07 N-	Max P{1}				( 3)	HOOP	91.29	117.90
	GR + Max P{1}	31120			1.00	(15) SUST	42.79	117.90
	TR:Amb to T1{1}			34222	1.00	(17) DISP	12.97	176.85
	Amb to T1{1}			34222	1.00	(17) DISP	12.97	176.85
	Sus. + E1{1}	31120	3836		1.00	(16) OCC	44.25	141.48
	Sus. + E2{1}	31120	3836		1.00	(16) OCC	44.25	141.48
	Sus. + E3{1}	31120	6856		1.00	(16) OCC	45.39	141.48
	Sus. + E4{1}	31120	6856		1.00	(16) OCC	45.39	141.48
	Sus. + W1{1}	31120	1698		1.00	(16) OCC	43.44	141.48
	Sus. + W2{1}	31120	1698		1.00	(16) OCC	43.44	141.48
	Sus. + W3{1}	31120	2122		1.00	(16) OCC	43.60	141.48
	Sus. + W4{1}	31120	2122		1.00	(16) OCC	43.60	141.48
A06 F+	Max P{1}				( 3)	HOOP	91.29	117.90
	GR + Max P{1}	35795			1.00	(15) SUST	44.56	117.90
	TR:Amb to T1{1}			46582	1.00	(17) DISP	17.65	176.85
	Amb to T1{1}			46582	1.00	(17) DISP	17.65	176.85
	Sus. + E1{1}	35795	11934		1.00	(16) OCC	49.09	141.48
	Sus. + E2{1}	35795	11934		1.00	(16) OCC	49.09	141.48
	Sus. + E3{1}	35795	9903		1.00	(16) OCC	48.32	141.48
	Sus. + E4{1}	35795	9903		1.00	(16) OCC	48.32	141.48
	Sus. + W1{1}	35795	4035		1.00	(16) OCC	46.09	141.48
	Sus. + W2{1}	35795	4035		1.00	(16) OCC	46.09	141.48
	Sus. + W3{1}	35795	3370		1.00	(16) OCC	45.84	141.48
	Sus. + W4{1}	35795	3370		1.00	(16) OCC	45.84	141.48
A06 N-	Max P{1}				( 3)	HOOP	91.29	117.90
	GR + Max P{1}	35612			1.00	(15) SUST	44.49	117.90
	TR:Amb to T1{1}			46484	1.00	(17) DISP	17.62	176.85
	Amb to T1{1}			46484	1.00	(17) DISP	17.62	176.85
	Sus. + E1{1}	35612	11953		1.00	(16) OCC	49.02	141.48
	Sus. + E2{1}	35612	11953		1.00	(16) OCC	49.02	141.48
	Sus. + E3{1}	35612	9518		1.00	(16) OCC	48.10	141.48
	Sus. + E4{1}	35612	9518		1.00	(16) OCC	48.10	141.48
	Sus. + W1{1}	35612	4107		1.00	(16) OCC	46.05	141.48
	Sus. + W2{1}	35612	4107		1.00	(16) OCC	46.05	141.48
	Sus. + W3{1}	35612	3256		1.00	(16) OCC	45.73	141.48
	Sus. + W4{1}	35612	3256		1.00	(16) OCC	45.73	141.48
A05 F+	Max P{1}				( 3)	HOOP	91.29	117.90
	GR + Max P{1}	12003			1.00	(15) SUST	35.55	117.90
	TR:Amb to T1{1}			125030	1.00	(17) DISP	47.38	176.85
	Amb to T1{1}			125030	1.00	(17) DISP	47.38	176.85
	Sus. + E1{1}	12003	10761		1.00	(16) OCC	39.63	141.48
	Sus. + E2{1}	12003	10761		1.00	(16) OCC	39.63	141.48
	Sus. + E3{1}	12003	2755		1.00	(16) OCC	36.59	141.48
	Sus. + E4{1}	12003	2755		1.00	(16) OCC	36.59	141.48
	Sus. + W1{1}	12003	3847		1.00	(16) OCC	37.01	141.48
	Sus. + W2{1}	12003	3847		1.00	(16) OCC	37.01	141.48
	Sus. + W3{1}	12003	779		1.00	(16) OCC	35.84	141.48
	Sus. + W4{1}	12003	779		1.00	(16) OCC	35.84	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A05 N-	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	8860			1.00	(15)	SUST	34.36	117.90
	TR:Amb to T1{1}			107151	1.00	(17)	DISP	40.61	176.85
	Amb to T1{1}			107151	1.00	(17)	DISP	40.61	176.85
	Sus. + E1{1}	8860	6883		1.00	(16)	OCC	36.97	141.48
	Sus. + E2{1}	8860	6883		1.00	(16)	OCC	36.97	141.48
	Sus. + E3{1}	8860	6097		1.00	(16)	OCC	36.67	141.48
	Sus. + E4{1}	8860	6097		1.00	(16)	OCC	36.67	141.48
	Sus. + W1{1}	8860	2383		1.00	(16)	OCC	35.26	141.48
	Sus. + W2{1}	8860	2383		1.00	(16)	OCC	35.26	141.48
	Sus. + W3{1}	8860	2089		1.00	(16)	OCC	35.15	141.48
	Sus. + W4{1}	8860	2089		1.00	(16)	OCC	35.15	141.48
A04 F+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	11357			1.00	(15)	SUST	35.30	117.90
	TR:Amb to T1{1}			72674	1.00	(17)	DISP	27.54	176.85
	Amb to T1{1}			72674	1.00	(17)	DISP	27.54	176.85
	Sus. + E1{1}	11357	8597		1.00	(16)	OCC	38.56	141.48
	Sus. + E2{1}	11357	8597		1.00	(16)	OCC	38.56	141.48
	Sus. + E3{1}	11357	5790		1.00	(16)	OCC	37.50	141.48
	Sus. + E4{1}	11357	5790		1.00	(16)	OCC	37.50	141.48
	Sus. + W1{1}	11357	2953		1.00	(16)	OCC	36.42	141.48
	Sus. + W2{1}	11357	2953		1.00	(16)	OCC	36.42	141.48
	Sus. + W3{1}	11357	1569		1.00	(16)	OCC	35.90	141.48
	Sus. + W4{1}	11357	1569		1.00	(16)	OCC	35.90	141.48
A04 F-	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	11357			3.20	(15)	SUST	41.31	117.90
	TR:Amb to T1{1}			72674	3.20	(17)	DISP	88.02	176.85
	Amb to T1{1}			72674	3.20	(17)	DISP	88.02	176.85
	Sus. + E1{1}	11357	8597		3.20	(16)	OCC	49.12	141.48
	Sus. + E2{1}	11357	8597		3.20	(16)	OCC	49.12	141.48
	Sus. + E3{1}	11357	5790		3.20	(16)	OCC	46.57	141.48
	Sus. + E4{1}	11357	5790		3.20	(16)	OCC	46.57	141.48
	Sus. + W1{1}	11357	2953		3.20	(16)	OCC	44.00	141.48
	Sus. + W2{1}	11357	2953		3.20	(16)	OCC	44.00	141.48
	Sus. + W3{1}	11357	1569		3.20	(16)	OCC	42.74	141.48
	Sus. + W4{1}	11357	1569		3.20	(16)	OCC	42.74	141.48
A04 N-	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	26092			1.00	(15)	SUST	40.89	117.90
	TR:Amb to T1{1}			133610	1.00	(17)	DISP	50.63	176.85
	Amb to T1{1}			133610	1.00	(17)	DISP	50.63	176.85
	Sus. + E1{1}	26092	15488		1.00	(16)	OCC	46.76	141.48
	Sus. + E2{1}	26092	15488		1.00	(16)	OCC	46.76	141.48
	Sus. + E3{1}	26092	7016		1.00	(16)	OCC	43.55	141.48
	Sus. + E4{1}	26092	7016		1.00	(16)	OCC	43.55	141.48
	Sus. + W1{1}	26092	5460		1.00	(16)	OCC	42.96	141.48
	Sus. + W2{1}	26092	5460		1.00	(16)	OCC	42.96	141.48
	Sus. + W3{1}	26092	1631		1.00	(16)	OCC	41.50	141.48
	Sus. + W4{1}	26092	1631		1.00	(16)	OCC	41.50	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A02 F+	Max P{1}					( 3)	HOOP	91.29	117.90
	GR + Max P{1}	27399			1.00	(15)	SUST	41.38	117.90
	TR:Amb to T1{1}			171224	1.00	(17)	DISP	64.89	176.85
	Amb to T1{1}			171224	1.00	(17)	DISP	64.89	176.85
	Sus. + E1{1}	27399	6856		1.00	(16)	OCC	43.98	141.48
	Sus. + E2{1}	27399	6856		1.00	(16)	OCC	43.98	141.48
	Sus. + E3{1}	27399	11242		1.00	(16)	OCC	45.64	141.48
	Sus. + E4{1}	27399	11242		1.00	(16)	OCC	45.64	141.48
	Sus. + W1{1}	27399	2209		1.00	(16)	OCC	42.22	141.48
	Sus. + W2{1}	27399	2209		1.00	(16)	OCC	42.22	141.48
	Sus. + W3{1}	27399	2816		1.00	(16)	OCC	42.45	141.48
	Sus. + W4{1}	27399	2816		1.00	(16)	OCC	42.45	141.48

A02 N-	Max P{1}			( 3)	HOOP	91.29	117.90
	GR + Max P{1}	19328		1.00	(15) SUST	38.32	117.90
	TR:Amb to Tl{1}		179294	1.00	(17) DISP	67.95	176.85
	Amb to Tl{1}		179294	1.00	(17) DISP	67.95	176.85
	Sus. + E1{1}	19328	8726	1.00	(16) OCC	41.63	141.48
	Sus. + E2{1}	19328	8726	1.00	(16) OCC	41.63	141.48
	Sus. + E3{1}	19328	10787	1.00	(16) OCC	42.41	141.48
	Sus. + E4{1}	19328	10787	1.00	(16) OCC	42.41	141.48
	Sus. + W1{1}	19328	2485	1.00	(16) OCC	39.27	141.48
	Sus. + W2{1}	19328	2485	1.00	(16) OCC	39.27	141.48
	Sus. + W3{1}	19328	2652	1.00	(16) OCC	39.33	141.48
	Sus. + W4{1}	19328	2652	1.00	(16) OCC	39.33	141.48
A00	Max P{1}			( 3)	HOOP	91.29	117.90
	GR + Max P{1}	24346		1.00	(15) SUST	40.22	117.90
	TR:Amb to Tl{1}		185165	1.00	(17) DISP	70.17	176.85
	Amb to Tl{1}		185165	1.00	(17) DISP	70.17	176.85
	Sus. + E1{1}	24346	18790	1.00	(16) OCC	47.35	141.48
	Sus. + E2{1}	24346	18790	1.00	(16) OCC	47.35	141.48
	Sus. + E3{1}	24346	18808	1.00	(16) OCC	47.35	141.48
	Sus. + E4{1}	24346	18808	1.00	(16) OCC	47.35	141.48
	Sus. + W1{1}	24346	5124	1.00	(16) OCC	42.17	141.48
	Sus. + W2{1}	24346	5124	1.00	(16) OCC	42.17	141.48
	Sus. + W3{1}	24346	4505	1.00	(16) OCC	41.93	141.48
	Sus. + W4{1}	24346	4505	1.00	(16) OCC	41.93	141.48

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R E S U L T   S U M M A R Y  
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Maximum sustained stress ratio

Point : A06 F  
Stress N/mm2 : 101.10  
Allowable N/mm2 : 117.90  
Ratio : 0.86  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A04 N  
Stress N/mm2 : 161.82  
Allowable N/mm2 : 176.85  
Ratio : 0.91  
Load combination : Max Range

Maximum occasional stress ratio

Point : A06 F  
Stress N/mm2 : 124.48  
Allowable N/mm2 : 141.48  
Ratio : 0.88  
Load combination : Sus. + E1{1}

Maximum hoop stress ratio

Point : A02 N  
Stress N/mm2 : 91.29  
Allowable N/mm2 : 117.90  
Ratio : 0.77  
Load combination : Max P{1}

\* \* \* The system satisfies ASME B31.1 (2014) code requirements \* \* \*  
\* \* \* for the selected options

**LAMPIRAN I**  
*GENERAL PIPE STRESS REPORT (OPERATING CONDITION WITH  
EXPANSION JOINT, PIPE THICKNESS = 9,525 mm)*

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 Operating Condition with Expansion Joint  
 01/08/2018 BLOWDOWN TANK VENT STRESS ANALYSIS  
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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A07 F-	Max P{1}					( 3) HOOP	17.02	117.90
	GR + Max P{1}	17779			7.74	(15) SUST	39.10	117.90
	TR:Amb to T1{1}			2007	7.74	(17) DISP	4.97	176.85
	Amb to T1{1}			2007	7.74	(17) DISP	4.97	176.85
	Sus. + E1{1}	17779	1463		7.74	(16) OCC	41.81	141.48
	Sus. + E2{1}	17779	1463		7.74	(16) OCC	41.81	141.48
	Sus. + E3{1}	17779	3781		7.74	(16) OCC	46.12	141.48
	Sus. + E4{1}	17779	3781		7.74	(16) OCC	46.12	141.48
	Sus. + W1{1}	17779	3083		7.74	(16) OCC	44.83	141.48
	Sus. + W2{1}	17779	3083		7.74	(16) OCC	44.83	141.48
	Sus. + W3{1}	17779	3111		7.74	(16) OCC	44.88	141.48
	Sus. + W4{1}	17779	3111		7.74	(16) OCC	44.88	141.48
A07 N+	Max P{1}					( 3) HOOP	17.02	117.90
	GR + Max P{1}	17041			7.74	(15) SUST	37.72	117.90
	TR:Amb to T1{1}			2050	7.74	(17) DISP	5.08	176.85
	Amb to T1{1}			2050	7.74	(17) DISP	5.08	176.85
	Sus. + E1{1}	17041	1760		7.74	(16) OCC	40.99	141.48
	Sus. + E2{1}	17041	1760		7.74	(16) OCC	40.99	141.48
	Sus. + E3{1}	17041	3927		7.74	(16) OCC	45.02	141.48
	Sus. + E4{1}	17041	3927		7.74	(16) OCC	45.02	141.48
	Sus. + W1{1}	17041	2208		7.74	(16) OCC	41.83	141.48
	Sus. + W2{1}	17041	2208		7.74	(16) OCC	41.83	141.48
	Sus. + W3{1}	17041	3321		7.74	(16) OCC	43.90	141.48
	Sus. + W4{1}	17041	3321		7.74	(16) OCC	43.90	141.48
A06 N+	Max P{1}					( 3) HOOP	17.02	117.90
	GR + Max P{1}	14013			7.74	(15) SUST	32.10	117.90
	TR:Amb to T1{1}			1935	7.74	(17) DISP	4.79	176.85
	Amb to T1{1}			1935	7.74	(17) DISP	4.79	176.85
	Sus. + E1{1}	14013	5430		7.74	(16) OCC	42.19	141.48
	Sus. + E2{1}	14013	5430		7.74	(16) OCC	42.19	141.48
	Sus. + E3{1}	14013	4240		7.74	(16) OCC	39.98	141.48
	Sus. + E4{1}	14013	4240		7.74	(16) OCC	39.98	141.48
	Sus. + W1{1}	14013	5291		7.74	(16) OCC	41.93	141.48
	Sus. + W2{1}	14013	5291		7.74	(16) OCC	41.93	141.48
	Sus. + W3{1}	14013	4068		7.74	(16) OCC	39.66	141.48
	Sus. + W4{1}	14013	4068		7.74	(16) OCC	39.66	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A06 F-	Max P{1}					( 3) HOOP	17.02	117.90
	GR + Max P{1}	14080			7.74	(15) SUST	32.22	117.90
	TR:Amb to T1{1}			1894	7.74	(17) DISP	4.69	176.85
	Amb to T1{1}			1894	7.74	(17) DISP	4.69	176.85
	Sus. + E1{1}	14080	5288		7.74	(16) OCC	42.05	141.48
	Sus. + E2{1}	14080	5288		7.74	(16) OCC	42.05	141.48
	Sus. + E3{1}	14080	4315		7.74	(16) OCC	40.24	141.48
	Sus. + E4{1}	14080	4315		7.74	(16) OCC	40.24	141.48
	Sus. + W1{1}	14080	5099		7.74	(16) OCC	41.70	141.48
	Sus. + W2{1}	14080	5099		7.74	(16) OCC	41.70	141.48
	Sus. + W3{1}	14080	4155		7.74	(16) OCC	39.94	141.48
	Sus. + W4{1}	14080	4155		7.74	(16) OCC	39.94	141.48
A09 F-	Max P{1}					( 3) HOOP	17.02	117.90

GR + Max P{1}	25996		4.14	(15)	SUST	31.93	117.90
TR:Amb to T1{1}			1229	4.14	(17)	DISP	1.63 176.85
Amb to T1{1}			1229	4.14	(17)	DISP	1.63 176.85
Sus. + E1{1}	25996	1847	4.14	(16)	OCC	33.77	141.48
Sus. + E2{1}	25996	1847	4.14	(16)	OCC	33.77	141.48
Sus. + E3{1}	25996	2334	4.14	(16)	OCC	34.25	141.48
Sus. + E4{1}	25996	2334	4.14	(16)	OCC	34.25	141.48
Sus. + W1{1}	25996	2425	4.14	(16)	OCC	34.34	141.48
Sus. + W2{1}	25996	2425	4.14	(16)	OCC	34.34	141.48
Sus. + W3{1}	25996	1781	4.14	(16)	OCC	33.70	141.48
Sus. + W4{1}	25996	1781	4.14	(16)	OCC	33.70	141.48
A10 + Max P{1}							
GR + Max P{1}	69597			( 3)	HOOP	17.02	117.90
TR:Amb to T1{1}			1259	1.00	(15)	SUST	28.34 117.90
Amb to T1{1}			1259	1.00	(17)	DISP	0.40 176.85
Sus. + E1{1}	69597	2211	1.00	(16)	OCC	29.05	141.48
Sus. + E2{1}	69597	2211	1.00	(16)	OCC	29.05	141.48
Sus. + E3{1}	69597	1763	1.00	(16)	OCC	28.91	141.48
Sus. + E4{1}	69597	1763	1.00	(16)	OCC	28.91	141.48
Sus. + W1{1}	69597	2221	1.00	(16)	OCC	29.05	141.48
Sus. + W2{1}	69597	2221	1.00	(16)	OCC	29.05	141.48
Sus. + W3{1}	69597	1415	1.00	(16)	OCC	28.80	141.48
Sus. + W4{1}	69597	1415	1.00	(16)	OCC	28.80	141.48
A10 - Max P{1}							
GR + Max P{1}	69597			( 3)	HOOP	17.02	117.90
TR:Amb to T1{1}			1259	1.00	(15)	SUST	28.34 117.90
Amb to T1{1}			1259	1.00	(17)	DISP	0.40 176.85
Sus. + E1{1}	69597	2211	1.00	(16)	OCC	29.05	141.48
Sus. + E2{1}	69597	2211	1.00	(16)	OCC	29.05	141.48
Sus. + E3{1}	69597	1763	1.00	(16)	OCC	28.91	141.48
Sus. + E4{1}	69597	1763	1.00	(16)	OCC	28.91	141.48
Sus. + W1{1}	69597	2221	1.00	(16)	OCC	29.05	141.48
Sus. + W2{1}	69597	2221	1.00	(16)	OCC	29.05	141.48
Sus. + W3{1}	69597	1415	1.00	(16)	OCC	28.80	141.48
Sus. + W4{1}	69597	1415	1.00	(16)	OCC	28.80	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )		Mc (Exp.)	S.I.F				
		Ma (Sus.)	Mb (Occ.)						
A02 F-	Max P{1}					( 3) HOOP	17.02	117.90	
	GR + Max P{1}	11772			4.14	(15) SUST	17.78	117.90	
	TR:Amb to T1{1}			2189	4.14	(17) DISP	2.90	176.85	
	Amb to T1{1}			2189	4.14	(17) DISP	2.90	176.85	
	Sus. + E1{1}	11772	9380		4.14	(16) OCC	27.11	141.48	
	Sus. + E2{1}	11772	9380		4.14	(16) OCC	27.11	141.48	
	Sus. + E3{1}	11772	6886		4.14	(16) OCC	24.63	141.48	
	Sus. + E4{1}	11772	6886		4.14	(16) OCC	24.63	141.48	
	Sus. + W1{1}	11772	7440		4.14	(16) OCC	25.18	141.48	
	Sus. + W2{1}	11772	7440		4.14	(16) OCC	25.18	141.48	
	Sus. + W3{1}	11772	5190		4.14	(16) OCC	22.94	141.48	
	Sus. + W4{1}	11772	5190		4.14	(16) OCC	22.94	141.48	
A11 F-	Max P{1}					( 3) HOOP	17.02	117.90	
	GR + Max P{1}	12245			4.14	(15) SUST	18.25	117.90	
	TR:Amb to T1{1}			895	4.14	(17) DISP	1.19	176.85	
	Amb to T1{1}			895	4.14	(17) DISP	1.19	176.85	
	Sus. + E1{1}	12245	2904		4.14	(16) OCC	21.14	141.48	
	Sus. + E2{1}	12245	2904		4.14	(16) OCC	21.14	141.48	
	Sus. + E3{1}	12245	3146		4.14	(16) OCC	21.38	141.48	
	Sus. + E4{1}	12245	3146		4.14	(16) OCC	21.38	141.48	
	Sus. + W1{1}	12245	5895		4.14	(16) OCC	24.11	141.48	
	Sus. + W2{1}	12245	5895		4.14	(16) OCC	24.11	141.48	
	Sus. + W3{1}	12245	3682		4.14	(16) OCC	21.91	141.48	
	Sus. + W4{1}	12245	3682		4.14	(16) OCC	21.91	141.48	
A09 N+	Max P{1}					( 3) HOOP	17.02	117.90	
	GR + Max P{1}	13842			4.14	(15) SUST	19.84	117.90	
	TR:Amb to T1{1}			1312	4.14	(17) DISP	1.74	176.85	
	Amb to T1{1}			1312	4.14	(17) DISP	1.74	176.85	
	Sus. + E1{1}	13842	2401		4.14	(16) OCC	22.23	141.48	

Sus. + E2{1}	13842	2401	4.14	(16)	OCC	22.23	141.48
Sus. + E3{1}	13842	2664	4.14	(16)	OCC	22.49	141.48
Sus. + E4{1}	13842	2664	4.14	(16)	OCC	22.49	141.48
Sus. + W1{1}	13842	1984	4.14	(16)	OCC	21.81	141.48
Sus. + W2{1}	13842	1984	4.14	(16)	OCC	21.81	141.48
Sus. + W3{1}	13842	2246	4.14	(16)	OCC	22.07	141.48
Sus. + W4{1}	13842	2246	4.14	(16)	OCC	22.07	141.48

A14 F- Max P{1}				( 3)	HOOP	17.02	117.90
GR + Max P{1}	5672		4.14	(15)	SUST	11.71	117.90
TR:Amb to T1{1}			236	4.14	(17)	DISP	0.31 176.85
Amb to T1{1}			236	4.14	(17)	DISP	0.31 176.85
Sus. + E1{1}	5672	6433	4.14	(16)	OCC	18.11	141.48
Sus. + E2{1}	5672	6433	4.14	(16)	OCC	18.11	141.48
Sus. + E3{1}	5672	3093	4.14	(16)	OCC	14.79	141.48
Sus. + E4{1}	5672	3093	4.14	(16)	OCC	14.79	141.48
Sus. + W1{1}	5672	10245	4.14	(16)	OCC	21.90	141.48
Sus. + W2{1}	5672	10245	4.14	(16)	OCC	21.90	141.48
Sus. + W3{1}	5672	4890	4.14	(16)	OCC	16.58	141.48
Sus. + W4{1}	5672	4890	4.14	(16)	OCC	16.58	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			Eq. no.	Load type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )					
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F			
A05 F- Max P{1}					( 3)	HOOP	17.02	117.90
GR + Max P{1}		8081			4.14	(15) SUST	14.11	117.90
TR:Amb to T1{1}				2876	4.14	(17) DISP	3.81	176.85
Amb to T1{1}				2876	4.14	(17) DISP	3.81	176.85
Sus. + E1{1}		8081	6522		4.14	(16) OCC	20.60	141.48
Sus. + E2{1}		8081	6522		4.14	(16) OCC	20.60	141.48
Sus. + E3{1}		8081	2925		4.14	(16) OCC	17.02	141.48
Sus. + E4{1}		8081	2925		4.14	(16) OCC	17.02	141.48
Sus. + W1{1}		8081	6101		4.14	(16) OCC	20.18	141.48
Sus. + W2{1}		8081	6101		4.14	(16) OCC	20.18	141.48
Sus. + W3{1}		8081	1986		4.14	(16) OCC	16.08	141.48
Sus. + W4{1}		8081	1986		4.14	(16) OCC	16.08	141.48
A04 N+ Max P{1}					( 3)	HOOP	17.02	117.90
GR + Max P{1}		7625			4.14	(15) SUST	13.65	117.90
TR:Amb to T1{1}				2971	4.14	(17) DISP	3.94	176.85
Amb to T1{1}				2971	4.14	(17) DISP	3.94	176.85
Sus. + E1{1}		7625	6647		4.14	(16) OCC	20.27	141.48
Sus. + E2{1}		7625	6647		4.14	(16) OCC	20.27	141.48
Sus. + E3{1}		7625	3468		4.14	(16) OCC	17.10	141.48
Sus. + E4{1}		7625	3468		4.14	(16) OCC	17.10	141.48
Sus. + W1{1}		7625	6331		4.14	(16) OCC	19.95	141.48
Sus. + W2{1}		7625	6331		4.14	(16) OCC	19.95	141.48
Sus. + W3{1}		7625	2620		4.14	(16) OCC	16.26	141.48
Sus. + W4{1}		7625	2620		4.14	(16) OCC	16.26	141.48
A08 + Max P{1}					( 3)	HOOP	17.02	117.90
GR + Max P{1}		11621			1.00	(15) SUST	9.79	117.90
TR:Amb to T1{1}				1882	1.00	(17) DISP	0.60	176.85
Amb to T1{1}				1882	1.00	(17) DISP	0.60	176.85
Sus. + E1{1}		11621	22149		1.00	(16) OCC	16.88	141.48
Sus. + E2{1}		11621	22149		1.00	(16) OCC	16.88	141.48
Sus. + E3{1}		11621	16062		1.00	(16) OCC	14.93	141.48
Sus. + E4{1}		11621	16062		1.00	(16) OCC	14.93	141.48
Sus. + W1{1}		11621	31228		1.00	(16) OCC	19.78	141.48
Sus. + W2{1}		11621	31228		1.00	(16) OCC	19.78	141.48
Sus. + W3{1}		11621	16681		1.00	(16) OCC	15.13	141.48
Sus. + W4{1}		11621	16681		1.00	(16) OCC	15.13	141.48
A08 - Max P{1}					( 3)	HOOP	17.02	117.90
GR + Max P{1}		11621			1.00	(15) SUST	9.79	117.90
TR:Amb to T1{1}				1882	1.00	(17) DISP	0.60	176.85
Amb to T1{1}				1882	1.00	(17) DISP	0.60	176.85
Sus. + E1{1}		11621	22149		1.00	(16) OCC	16.88	141.48
Sus. + E2{1}		11621	22149		1.00	(16) OCC	16.88	141.48
Sus. + E3{1}		11621	16062		1.00	(16) OCC	14.93	141.48
Sus. + E4{1}		11621	16062		1.00	(16) OCC	14.93	141.48
Sus. + W1{1}		11621	31228		1.00	(16) OCC	19.78	141.48

Sus. + W2{1}	11621	31228	1.00	(16)	OCC	19.78	141.48
Sus. + W3{1}	11621	16681	1.00	(16)	OCC	15.13	141.48
Sus. + W4{1}	11621	16681	1.00	(16)	OCC	15.13	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Moments in N.m )		(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Load type		
A05 N+	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	8202			4.14	(15)	SUST	14.23	117.90
	TR:Amb to T1{1}			2892	4.14	(17)	DISP	3.84	176.85
	Amb to T1{1}			2892	4.14	(17)	DISP	3.84	176.85
	Sus. + E1{1}	8202	5262		4.14	(16)	OCC	19.46	141.48
	Sus. + E2{1}	8202	5262		4.14	(16)	OCC	19.46	141.48
	Sus. + E3{1}	8202	3459		4.14	(16)	OCC	17.67	141.48
	Sus. + E4{1}	8202	3459		4.14	(16)	OCC	17.67	141.48
	Sus. + W1{1}	8202	4577		4.14	(16)	OCC	18.78	141.48
	Sus. + W2{1}	8202	4577		4.14	(16)	OCC	18.78	141.48
	Sus. + W3{1}	8202	2871		4.14	(16)	OCC	17.08	141.48
	Sus. + W4{1}	8202	2871		4.14	(16)	OCC	17.08	141.48
A04 F-	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	7523			4.14	(15)	SUST	13.55	117.90
	TR:Amb to T1{1}			2395	4.14	(17)	DISP	3.18	176.85
	Amb to T1{1}			2395	4.14	(17)	DISP	3.18	176.85
	Sus. + E1{1}	7523	4279		4.14	(16)	OCC	17.81	141.48
	Sus. + E2{1}	7523	4279		4.14	(16)	OCC	17.81	141.48
	Sus. + E3{1}	7523	4427		4.14	(16)	OCC	17.96	141.48
	Sus. + E4{1}	7523	4427		4.14	(16)	OCC	17.96	141.48
	Sus. + W1{1}	7523	3678		4.14	(16)	OCC	17.21	141.48
	Sus. + W2{1}	7523	3678		4.14	(16)	OCC	17.21	141.48
	Sus. + W3{1}	7523	3459		4.14	(16)	OCC	16.99	141.48
	Sus. + W4{1}	7523	3459		4.14	(16)	OCC	16.99	141.48
A13 F-	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	5898			4.14	(15)	SUST	11.94	117.90
	TR:Amb to T1{1}			437	4.14	(17)	DISP	0.58	176.85
	Amb to T1{1}			437	4.14	(17)	DISP	0.58	176.85
	Sus. + E1{1}	5898	3218		4.14	(16)	OCC	15.14	141.48
	Sus. + E2{1}	5898	3218		4.14	(16)	OCC	15.14	141.48
	Sus. + E3{1}	5898	1461		4.14	(16)	OCC	13.39	141.48
	Sus. + E4{1}	5898	1461		4.14	(16)	OCC	13.39	141.48
	Sus. + W1{1}	5898	5785		4.14	(16)	OCC	17.69	141.48
	Sus. + W2{1}	5898	5785		4.14	(16)	OCC	17.69	141.48
	Sus. + W3{1}	5898	2217		4.14	(16)	OCC	14.14	141.48
	Sus. + W4{1}	5898	2217		4.14	(16)	OCC	14.14	141.48
A13 N+	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	3452			4.14	(15)	SUST	9.50	117.90
	TR:Amb to T1{1}			521	4.14	(17)	DISP	0.69	176.85
	Amb to T1{1}			521	4.14	(17)	DISP	0.69	176.85
	Sus. + E1{1}	3452	4064		4.14	(16)	OCC	13.54	141.48
	Sus. + E2{1}	3452	4064		4.14	(16)	OCC	13.54	141.48
	Sus. + E3{1}	3452	1966		4.14	(16)	OCC	11.46	141.48
	Sus. + E4{1}	3452	1966		4.14	(16)	OCC	11.46	141.48
	Sus. + W1{1}	3452	8066		4.14	(16)	OCC	17.53	141.48
	Sus. + W2{1}	3452	8066		4.14	(16)	OCC	17.53	141.48
	Sus. + W3{1}	3452	3285		4.14	(16)	OCC	12.77	141.48
	Sus. + W4{1}	3452	3285		4.14	(16)	OCC	12.77	141.48

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Point	Load	ASME B31.1 (2014) CODE COMPLIANCE		(Moments in N.m )		(Stress in N/mm2 )		Code	Code
		Ma	Mb	Mc	Eq. Load				

name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no.	type	Stress	Allow.
A15	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	3533			1.00	(15)	SUST	7.20	117.90
	TR:Amb to T1{1}			491	1.00	(17)	DISP	0.16	176.85
	Amb to T1{1}			491	1.00	(17)	DISP	0.16	176.85
	Sus. + E1{1}	3533	12299		1.00	(16)	OCC	11.13	141.48
	Sus. + E2{1}	3533	12299		1.00	(16)	OCC	11.13	141.48
	Sus. + E3{1}	3533	12866		1.00	(16)	OCC	11.32	141.48
	Sus. + E4{1}	3533	12866		1.00	(16)	OCC	11.32	141.48
	Sus. + W1{1}	3533	23279		1.00	(16)	OCC	14.65	141.48
	Sus. + W2{1}	3533	23279		1.00	(16)	OCC	14.65	141.48
	Sus. + W3{1}	3533	18741		1.00	(16)	OCC	13.20	141.48
	Sus. + W4{1}	3533	18741		1.00	(16)	OCC	13.20	141.48
	A14 F+	Max P{1}					( 3)	HOOP	17.02
GR + Max P{1}		5672			1.00	(15)	SUST	7.88	117.90
TR:Amb to T1{1}				236	1.00	(17)	DISP	0.08	176.85
Amb to T1{1}				236	1.00	(17)	DISP	0.08	176.85
Sus. + E1{1}		5672	6433		1.00	(16)	OCC	9.94	141.48
Sus. + E2{1}		5672	6433		1.00	(16)	OCC	9.94	141.48
Sus. + E3{1}		5672	3093		1.00	(16)	OCC	8.87	141.48
Sus. + E4{1}		5672	3093		1.00	(16)	OCC	8.87	141.48
Sus. + W1{1}		5672	10245		1.00	(16)	OCC	11.16	141.48
Sus. + W2{1}		5672	10245		1.00	(16)	OCC	11.16	141.48
Sus. + W3{1}		5672	4890		1.00	(16)	OCC	9.45	141.48
Sus. + W4{1}		5672	4890		1.00	(16)	OCC	9.45	141.48
A14 N+		Max P{1}					( 3)	HOOP	17.02
	GR + Max P{1}	2155			4.14	(15)	SUST	8.21	117.90
	TR:Amb to T1{1}			183	4.14	(17)	DISP	0.24	176.85
	Amb to T1{1}			183	4.14	(17)	DISP	0.24	176.85
	Sus. + E1{1}	2155	5074		4.14	(16)	OCC	13.26	141.48
	Sus. + E2{1}	2155	5074		4.14	(16)	OCC	13.26	141.48
	Sus. + E3{1}	2155	2394		4.14	(16)	OCC	10.59	141.48
	Sus. + E4{1}	2155	2394		4.14	(16)	OCC	10.59	141.48
	Sus. + W1{1}	2155	7260		4.14	(16)	OCC	15.43	141.48
	Sus. + W2{1}	2155	7260		4.14	(16)	OCC	15.43	141.48
	Sus. + W3{1}	2155	3996		4.14	(16)	OCC	12.19	141.48
	Sus. + W4{1}	2155	3996		4.14	(16)	OCC	12.19	141.48
	A14 N-	Max P{1}					( 3)	HOOP	17.02
GR + Max P{1}		2155			1.00	(15)	SUST	6.76	117.90
TR:Amb to T1{1}				183	1.00	(17)	DISP	0.06	176.85
Amb to T1{1}				183	1.00	(17)	DISP	0.06	176.85
Sus. + E1{1}		2155	5074		1.00	(16)	OCC	8.38	141.48
Sus. + E2{1}		2155	5074		1.00	(16)	OCC	8.38	141.48
Sus. + E3{1}		2155	2394		1.00	(16)	OCC	7.52	141.48
Sus. + E4{1}		2155	2394		1.00	(16)	OCC	7.52	141.48
Sus. + W1{1}		2155	7260		1.00	(16)	OCC	9.08	141.48
Sus. + W2{1}		2155	7260		1.00	(16)	OCC	9.08	141.48
Sus. + W3{1}		2155	3996		1.00	(16)	OCC	8.04	141.48
Sus. + W4{1}		2155	3996		1.00	(16)	OCC	8.04	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. no.	Load type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )						
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)					
A13 F+	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	5898			1.00	(15)	SUST	7.95	117.90
	TR:Amb to T1{1}			437	1.00	(17)	DISP	0.14	176.85
	Amb to T1{1}			437	1.00	(17)	DISP	0.14	176.85
	Sus. + E1{1}	5898	3218		1.00	(16)	OCC	8.98	141.48
	Sus. + E2{1}	5898	3218		1.00	(16)	OCC	8.98	141.48
	Sus. + E3{1}	5898	1461		1.00	(16)	OCC	8.42	141.48
	Sus. + E4{1}	5898	1461		1.00	(16)	OCC	8.42	141.48
	Sus. + W1{1}	5898	5785		1.00	(16)	OCC	9.81	141.48
	Sus. + W2{1}	5898	5785		1.00	(16)	OCC	9.81	141.48
	Sus. + W3{1}	5898	2217		1.00	(16)	OCC	8.66	141.48
	Sus. + W4{1}	5898	2217		1.00	(16)	OCC	8.66	141.48
	A13 N-	Max P{1}					( 3)	HOOP	17.02
GR + Max P{1}		3452			1.00	(15)	SUST	7.17	117.90



TR:Amb to T1{1}			521	1.00	(17)	DISP	0.17	176.85
Amb to T1{1}			521	1.00	(17)	DISP	0.17	176.85
Sus. + E1{1}	3452	4064		1.00	(16)	OCC	8.47	141.48
Sus. + E2{1}	3452	4064		1.00	(16)	OCC	8.47	141.48
Sus. + E3{1}	3452	1966		1.00	(16)	OCC	7.80	141.48
Sus. + E4{1}	3452	1966		1.00	(16)	OCC	7.80	141.48
Sus. + W1{1}	3452	8066		1.00	(16)	OCC	9.75	141.48
Sus. + W2{1}	3452	8066		1.00	(16)	OCC	9.75	141.48
Sus. + W3{1}	3452	3285		1.00	(16)	OCC	8.22	141.48
Sus. + W4{1}	3452	3285		1.00	(16)	OCC	8.22	141.48
A12 + Max P{1}								
GR + Max P{1}	12580			1.00	(15)	SUST	10.09	117.90
TR:Amb to T1{1}			905	1.00	(17)	DISP	0.29	176.85
Amb to T1{1}			905	1.00	(17)	DISP	0.29	176.85
Sus. + E1{1}	12580	3096		1.00	(16)	OCC	11.08	141.48
Sus. + E2{1}	12580	3096		1.00	(16)	OCC	11.08	141.48
Sus. + E3{1}	12580	3390		1.00	(16)	OCC	11.18	141.48
Sus. + E4{1}	12580	3390		1.00	(16)	OCC	11.18	141.48
Sus. + W1{1}	12580	6090		1.00	(16)	OCC	12.04	141.48
Sus. + W2{1}	12580	6090		1.00	(16)	OCC	12.04	141.48
Sus. + W3{1}	12580	3869		1.00	(16)	OCC	11.33	141.48
Sus. + W4{1}	12580	3869		1.00	(16)	OCC	11.33	141.48
A12 - Max P{1}								
GR + Max P{1}	12580			1.00	(15)	SUST	10.09	117.90
TR:Amb to T1{1}			905	1.00	(17)	DISP	0.29	176.85
Amb to T1{1}			905	1.00	(17)	DISP	0.29	176.85
Sus. + E1{1}	12580	3096		1.00	(16)	OCC	11.08	141.48
Sus. + E2{1}	12580	3096		1.00	(16)	OCC	11.08	141.48
Sus. + E3{1}	12580	3390		1.00	(16)	OCC	11.18	141.48
Sus. + E4{1}	12580	3390		1.00	(16)	OCC	11.18	141.48
Sus. + W1{1}	12580	6090		1.00	(16)	OCC	12.04	141.48
Sus. + W2{1}	12580	6090		1.00	(16)	OCC	12.04	141.48
Sus. + W3{1}	12580	3869		1.00	(16)	OCC	11.33	141.48
Sus. + W4{1}	12580	3869		1.00	(16)	OCC	11.33	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
		(Moments in N.m )			(Stress in N/mm2 )				
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.	
-----									
All F+	Max P{1}					( 3) HOOP	17.02	117.90	
	GR + Max P{1}	12245			1.00	(15) SUST	9.99	117.90	
	TR:Amb to T1{1}			895	1.00	(17) DISP	0.29	176.85	
	Amb to T1{1}			895	1.00	(17) DISP	0.29	176.85	
	Sus. + E1{1}	12245	2904		1.00	(16) OCC	10.92	141.48	
	Sus. + E2{1}	12245	2904		1.00	(16) OCC	10.92	141.48	
	Sus. + E3{1}	12245	3146		1.00	(16) OCC	10.99	141.48	
	Sus. + E4{1}	12245	3146		1.00	(16) OCC	10.99	141.48	
	Sus. + W1{1}	12245	5895		1.00	(16) OCC	11.87	141.48	
	Sus. + W2{1}	12245	5895		1.00	(16) OCC	11.87	141.48	
	Sus. + W3{1}	12245	3682		1.00	(16) OCC	11.16	141.48	
	Sus. + W4{1}	12245	3682		1.00	(16) OCC	11.16	141.48	
-----									
All N+	Max P{1}					( 3) HOOP	17.02	117.90	
	GR + Max P{1}	8286			4.14	(15) SUST	14.31	117.90	
	TR:Amb to T1{1}			935	4.14	(17) DISP	1.24	176.85	
	Amb to T1{1}			935	4.14	(17) DISP	1.24	176.85	
	Sus. + E1{1}	8286	1184		4.14	(16) OCC	15.49	141.48	
	Sus. + E2{1}	8286	1184		4.14	(16) OCC	15.49	141.48	
	Sus. + E3{1}	8286	1023		4.14	(16) OCC	15.33	141.48	
	Sus. + E4{1}	8286	1023		4.14	(16) OCC	15.33	141.48	
	Sus. + W1{1}	8286	2475		4.14	(16) OCC	16.77	141.48	
	Sus. + W2{1}	8286	2475		4.14	(16) OCC	16.77	141.48	
	Sus. + W3{1}	8286	1727		4.14	(16) OCC	16.03	141.48	
	Sus. + W4{1}	8286	1727		4.14	(16) OCC	16.03	141.48	
-----									
All N-	Max P{1}					( 3) HOOP	17.02	117.90	
	GR + Max P{1}	8286			1.00	(15) SUST	8.72	117.90	
	TR:Amb to T1{1}			935	1.00	(17) DISP	0.30	176.85	
	Amb to T1{1}			935	1.00	(17) DISP	0.30	176.85	
	Sus. + E1{1}	8286	1184		1.00	(16) OCC	9.10	141.48	
	Sus. + E2{1}	8286	1184		1.00	(16) OCC	9.10	141.48	

Sus. + E3{1}	8286	1023	1.00	(16)	OCC	9.05	141.48
Sus. + E4{1}	8286	1023	1.00	(16)	OCC	9.05	141.48
Sus. + W1{1}	8286	2475	1.00	(16)	OCC	9.51	141.48
Sus. + W2{1}	8286	2475	1.00	(16)	OCC	9.51	141.48
Sus. + W3{1}	8286	1727	1.00	(16)	OCC	9.27	141.48
Sus. + W4{1}	8286	1727	1.00	(16)	OCC	9.27	141.48

A09 F+ Max P{1}				( 3)	HOOP	17.02	117.90
GR + Max P{1}	25996		1.00	(15)	SUST	14.39	117.90
TR:Amb to T1{1}			1229	1.00	(17)	DISP	0.39 176.85
Amb to T1{1}			1229	1.00	(17)	DISP	0.39 176.85
Sus. + E1{1}	25996	1847	1.00	(16)	OCC	14.98	141.48
Sus. + E2{1}	25996	1847	1.00	(16)	OCC	14.98	141.48
Sus. + E3{1}	25996	2334	1.00	(16)	OCC	15.13	141.48
Sus. + E4{1}	25996	2334	1.00	(16)	OCC	15.13	141.48
Sus. + W1{1}	25996	2425	1.00	(16)	OCC	15.16	141.48
Sus. + W2{1}	25996	2425	1.00	(16)	OCC	15.16	141.48
Sus. + W3{1}	25996	1781	1.00	(16)	OCC	14.96	141.48
Sus. + W4{1}	25996	1781	1.00	(16)	OCC	14.96	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )						
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F			
A09 N- Max P{1}						( 3) HOOP	17.02	117.90
GR + Max P{1}		13842			1.00	(15) SUST	10.50	117.90
TR:Amb to T1{1}				1312	1.00	(17) DISP	0.42	176.85
Amb to T1{1}				1312	1.00	(17) DISP	0.42	176.85
Sus. + E1{1}		13842	2401		1.00	(16) OCC	11.27	141.48
Sus. + E2{1}		13842	2401		1.00	(16) OCC	11.27	141.48
Sus. + E3{1}		13842	2664		1.00	(16) OCC	11.35	141.48
Sus. + E4{1}		13842	2664		1.00	(16) OCC	11.35	141.48
Sus. + W1{1}		13842	1984		1.00	(16) OCC	11.13	141.48
Sus. + W2{1}		13842	1984		1.00	(16) OCC	11.13	141.48
Sus. + W3{1}		13842	2246		1.00	(16) OCC	11.22	141.48
Sus. + W4{1}		13842	2246		1.00	(16) OCC	11.22	141.48
A07 F+ Max P{1}						( 3) HOOP	17.02	117.90
GR + Max P{1}		17779			1.00	(15) SUST	11.76	117.90
TR:Amb to T1{1}				2007	1.00	(17) DISP	0.64	176.85
Amb to T1{1}				2007	1.00	(17) DISP	0.64	176.85
Sus. + E1{1}		17779	1463		1.00	(16) OCC	12.23	141.48
Sus. + E2{1}		17779	1463		1.00	(16) OCC	12.23	141.48
Sus. + E3{1}		17779	3781		1.00	(16) OCC	12.97	141.48
Sus. + E4{1}		17779	3781		1.00	(16) OCC	12.97	141.48
Sus. + W1{1}		17779	3083		1.00	(16) OCC	12.74	141.48
Sus. + W2{1}		17779	3083		1.00	(16) OCC	12.74	141.48
Sus. + W3{1}		17779	3111		1.00	(16) OCC	12.75	141.48
Sus. + W4{1}		17779	3111		1.00	(16) OCC	12.75	141.48
A07 N- Max P{1}						( 3) HOOP	17.02	117.90
GR + Max P{1}		17041			1.00	(15) SUST	11.52	117.90
TR:Amb to T1{1}				2050	1.00	(17) DISP	0.66	176.85
Amb to T1{1}				2050	1.00	(17) DISP	0.66	176.85
Sus. + E1{1}		17041	1760		1.00	(16) OCC	12.08	141.48
Sus. + E2{1}		17041	1760		1.00	(16) OCC	12.08	141.48
Sus. + E3{1}		17041	3927		1.00	(16) OCC	12.78	141.48
Sus. + E4{1}		17041	3927		1.00	(16) OCC	12.78	141.48
Sus. + W1{1}		17041	2208		1.00	(16) OCC	12.23	141.48
Sus. + W2{1}		17041	2208		1.00	(16) OCC	12.23	141.48
Sus. + W3{1}		17041	3321		1.00	(16) OCC	12.58	141.48
Sus. + W4{1}		17041	3321		1.00	(16) OCC	12.58	141.48
A06 F+ Max P{1}						( 3) HOOP	17.02	117.90
GR + Max P{1}		14080			1.00	(15) SUST	10.57	117.90
TR:Amb to T1{1}				1894	1.00	(17) DISP	0.61	176.85
Amb to T1{1}				1894	1.00	(17) DISP	0.61	176.85
Sus. + E1{1}		14080	5288		1.00	(16) OCC	12.27	141.48
Sus. + E2{1}		14080	5288		1.00	(16) OCC	12.27	141.48
Sus. + E3{1}		14080	4315		1.00	(16) OCC	11.95	141.48
Sus. + E4{1}		14080	4315		1.00	(16) OCC	11.95	141.48
Sus. + W1{1}		14080	5099		1.00	(16) OCC	12.21	141.48
Sus. + W2{1}		14080	5099		1.00	(16) OCC	12.21	141.48

Sus. + W3{1}	14080	4155	1.00	(16)	OCC	11.90	141.48
Sus. + W4{1}	14080	4155	1.00	(16)	OCC	11.90	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm2 )		Code Stress	Code Allow.
		(Moments in N.m )			S.I.F	Eq. Load no. type		
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A06 N-	Max P{1}					( 3) HOOP	17.02	117.90
	GR + Max P{1}	14013			1.00	(15) SUST	10.55	117.90
	TR:Amb to T1{1}			1935	1.00	(17) DISP	0.62	176.85
	Amb to T1{1}			1935	1.00	(17) DISP	0.62	176.85
	Sus. + E1{1}	14013	5430		1.00	(16) OCC	12.29	141.48
	Sus. + E2{1}	14013	5430		1.00	(16) OCC	12.29	141.48
	Sus. + E3{1}	14013	4240		1.00	(16) OCC	11.91	141.48
	Sus. + E4{1}	14013	4240		1.00	(16) OCC	11.91	141.48
	Sus. + W1{1}	14013	5291		1.00	(16) OCC	12.25	141.48
	Sus. + W2{1}	14013	5291		1.00	(16) OCC	12.25	141.48
	Sus. + W3{1}	14013	4068		1.00	(16) OCC	11.85	141.48
	Sus. + W4{1}	14013	4068		1.00	(16) OCC	11.85	141.48
A05 F+	Max P{1}					( 3) HOOP	17.02	117.90
	GR + Max P{1}	8081			1.00	(15) SUST	8.65	117.90
	TR:Amb to T1{1}			2876	1.00	(17) DISP	0.92	176.85
	Amb to T1{1}			2876	1.00	(17) DISP	0.92	176.85
	Sus. + E1{1}	8081	6522		1.00	(16) OCC	10.74	141.48
	Sus. + E2{1}	8081	6522		1.00	(16) OCC	10.74	141.48
	Sus. + E3{1}	8081	2925		1.00	(16) OCC	9.59	141.48
	Sus. + E4{1}	8081	2925		1.00	(16) OCC	9.59	141.48
	Sus. + W1{1}	8081	6101		1.00	(16) OCC	10.61	141.48
	Sus. + W2{1}	8081	6101		1.00	(16) OCC	10.61	141.48
	Sus. + W3{1}	8081	1986		1.00	(16) OCC	9.29	141.48
	Sus. + W4{1}	8081	1986		1.00	(16) OCC	9.29	141.48
A05 N-	Max P{1}					( 3) HOOP	17.02	117.90
	GR + Max P{1}	8202			1.00	(15) SUST	8.69	117.90
	TR:Amb to T1{1}			2892	1.00	(17) DISP	0.93	176.85
	Amb to T1{1}			2892	1.00	(17) DISP	0.93	176.85
	Sus. + E1{1}	8202	5262		1.00	(16) OCC	10.38	141.48
	Sus. + E2{1}	8202	5262		1.00	(16) OCC	10.38	141.48
	Sus. + E3{1}	8202	3459		1.00	(16) OCC	9.80	141.48
	Sus. + E4{1}	8202	3459		1.00	(16) OCC	9.80	141.48
	Sus. + W1{1}	8202	4577		1.00	(16) OCC	10.16	141.48
	Sus. + W2{1}	8202	4577		1.00	(16) OCC	10.16	141.48
	Sus. + W3{1}	8202	2871		1.00	(16) OCC	9.61	141.48
	Sus. + W4{1}	8202	2871		1.00	(16) OCC	9.61	141.48
A04 F+	Max P{1}					( 3) HOOP	17.02	117.90
	GR + Max P{1}	7523			1.00	(15) SUST	8.47	117.90
	TR:Amb to T1{1}			2395	1.00	(17) DISP	0.77	176.85
	Amb to T1{1}			2395	1.00	(17) DISP	0.77	176.85
	Sus. + E1{1}	7523	4279		1.00	(16) OCC	9.84	141.48
	Sus. + E2{1}	7523	4279		1.00	(16) OCC	9.84	141.48
	Sus. + E3{1}	7523	4427		1.00	(16) OCC	9.89	141.48
	Sus. + E4{1}	7523	4427		1.00	(16) OCC	9.89	141.48
	Sus. + W1{1}	7523	3678		1.00	(16) OCC	9.65	141.48
	Sus. + W2{1}	7523	3678		1.00	(16) OCC	9.65	141.48
	Sus. + W3{1}	7523	3459		1.00	(16) OCC	9.58	141.48
	Sus. + W4{1}	7523	3459		1.00	(16) OCC	9.58	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm2 )		Code Stress	Code Allow.
		(Moments in N.m )			S.I.F	Eq. Load no. type		
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				

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A04 N-	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	7625			1.00	(15)	SUST	8.51	117.90
	TR:Amb to T1{1}			2971	1.00	(17)	DISP	0.95	176.85
	Amb to T1{1}			2971	1.00	(17)	DISP	0.95	176.85
	Sus. + E1{1}	7625	6647		1.00	(16)	OCC	10.63	141.48
	Sus. + E2{1}	7625	6647		1.00	(16)	OCC	10.63	141.48
	Sus. + E3{1}	7625	3468		1.00	(16)	OCC	9.62	141.48
	Sus. + E4{1}	7625	3468		1.00	(16)	OCC	9.62	141.48
	Sus. + W1{1}	7625	6331		1.00	(16)	OCC	10.53	141.48
	Sus. + W2{1}	7625	6331		1.00	(16)	OCC	10.53	141.48
	Sus. + W3{1}	7625	2620		1.00	(16)	OCC	9.35	141.48
	Sus. + W4{1}	7625	2620		1.00	(16)	OCC	9.35	141.48
A03 +	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	20381			1.00	(15)	SUST	12.59	117.90
	TR:Amb to T1{1}			4345	1.00	(17)	DISP	1.39	176.85
	Amb to T1{1}			4345	1.00	(17)	DISP	1.39	176.85
	Sus. + E1{1}	20381	8947		1.00	(16)	OCC	15.45	141.48
	Sus. + E2{1}	20381	8947		1.00	(16)	OCC	15.45	141.48
	Sus. + E3{1}	20381	10341		1.00	(16)	OCC	15.90	141.48
	Sus. + E4{1}	20381	10341		1.00	(16)	OCC	15.90	141.48
	Sus. + W1{1}	20381	7499		1.00	(16)	OCC	14.99	141.48
	Sus. + W2{1}	20381	7499		1.00	(16)	OCC	14.99	141.48
	Sus. + W3{1}	20381	8445		1.00	(16)	OCC	15.29	141.48
	Sus. + W4{1}	20381	8445		1.00	(16)	OCC	15.29	141.48
A03 -	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	20381			1.00	(15)	SUST	12.59	117.90
	TR:Amb to T1{1}			4345	1.00	(17)	DISP	1.39	176.85
	Amb to T1{1}			4345	1.00	(17)	DISP	1.39	176.85
	Sus. + E1{1}	20381	8947		1.00	(16)	OCC	15.45	141.48
	Sus. + E2{1}	20381	8947		1.00	(16)	OCC	15.45	141.48
	Sus. + E3{1}	20381	10341		1.00	(16)	OCC	15.90	141.48
	Sus. + E4{1}	20381	10341		1.00	(16)	OCC	15.90	141.48
	Sus. + W1{1}	20381	7499		1.00	(16)	OCC	14.99	141.48
	Sus. + W2{1}	20381	7499		1.00	(16)	OCC	14.99	141.48
	Sus. + W3{1}	20381	8445		1.00	(16)	OCC	15.29	141.48
	Sus. + W4{1}	20381	8445		1.00	(16)	OCC	15.29	141.48
A02 F+	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	11772			1.00	(15)	SUST	9.83	117.90
	TR:Amb to T1{1}			2189	1.00	(17)	DISP	0.70	176.85
	Amb to T1{1}			2189	1.00	(17)	DISP	0.70	176.85
	Sus. + E1{1}	11772	9380		1.00	(16)	OCC	12.84	141.48
	Sus. + E2{1}	11772	9380		1.00	(16)	OCC	12.84	141.48
	Sus. + E3{1}	11772	6886		1.00	(16)	OCC	12.04	141.48
	Sus. + E4{1}	11772	6886		1.00	(16)	OCC	12.04	141.48
	Sus. + W1{1}	11772	7440		1.00	(16)	OCC	12.22	141.48
	Sus. + W2{1}	11772	7440		1.00	(16)	OCC	12.22	141.48
	Sus. + W3{1}	11772	5190		1.00	(16)	OCC	11.50	141.48
	Sus. + W4{1}	11772	5190		1.00	(16)	OCC	11.50	141.48
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ASME B31.1 (2014) CODE COMPLIANCE									
		(Moments in N.m )			(Stress in N/mm2 )				
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.	
A02 N+	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	5507			4.14	(15)	SUST	11.55	117.90
	TR:Amb to T1{1}			1777	4.14	(17)	DISP	2.36	176.85
	Amb to T1{1}			1777	4.14	(17)	DISP	2.36	176.85
	Sus. + E1{1}	5507	5030		4.14	(16)	OCC	16.55	141.48
	Sus. + E2{1}	5507	5030		4.14	(16)	OCC	16.55	141.48
	Sus. + E3{1}	5507	4123		4.14	(16)	OCC	15.65	141.48
	Sus. + E4{1}	5507	4123		4.14	(16)	OCC	15.65	141.48
	Sus. + W1{1}	5507	3770		4.14	(16)	OCC	15.30	141.48
	Sus. + W2{1}	5507	3770		4.14	(16)	OCC	15.30	141.48
	Sus. + W3{1}	5507	2832		4.14	(16)	OCC	14.36	141.48
	Sus. + W4{1}	5507	2832		4.14	(16)	OCC	14.36	141.48
A02 N-	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	5507			1.00	(15)	SUST	7.83	117.90
	TR:Amb to T1{1}			1777	1.00	(17)	DISP	0.57	176.85

	Amb to T1{1}			1777	1.00	(17)	DISP	0.57	176.85
	Sus. + E1{1}	5507	5030		1.00	(16)	OCC	9.44	141.48
	Sus. + E2{1}	5507	5030		1.00	(16)	OCC	9.44	141.48
	Sus. + E3{1}	5507	4123		1.00	(16)	OCC	9.15	141.48
	Sus. + E4{1}	5507	4123		1.00	(16)	OCC	9.15	141.48
	Sus. + W1{1}	5507	3770		1.00	(16)	OCC	9.04	141.48
	Sus. + W2{1}	5507	3770		1.00	(16)	OCC	9.04	141.48
	Sus. + W3{1}	5507	2832		1.00	(16)	OCC	8.74	141.48
	Sus. + W4{1}	5507	2832		1.00	(16)	OCC	8.74	141.48
A01	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	4622			1.00	(15)	SUST	7.55	117.90
	TR:Amb to T1{1}			1759	1.00	(17)	DISP	0.56	176.85
	Amb to T1{1}			1759	1.00	(17)	DISP	0.56	176.85
	Sus. + E1{1}	4622	2107		1.00	(16)	OCC	8.22	141.48
	Sus. + E2{1}	4622	2107		1.00	(16)	OCC	8.22	141.48
	Sus. + E3{1}	4622	3909		1.00	(16)	OCC	8.80	141.48
	Sus. + E4{1}	4622	3909		1.00	(16)	OCC	8.80	141.48
	Sus. + W1{1}	4622	1113		1.00	(16)	OCC	7.90	141.48
	Sus. + W2{1}	4622	1113		1.00	(16)	OCC	7.90	141.48
	Sus. + W3{1}	4622	2674		1.00	(16)	OCC	8.40	141.48
	Sus. + W4{1}	4622	2674		1.00	(16)	OCC	8.40	141.48

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-----  
R E S U L T     S U M M A R Y  
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Maximum sustained stress ratio

Point            : A07 F  
Stress        N/mm2 : 39.10  
Allowable N/mm2 : 117.90  
Ratio            : 0.33  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point            : A07 N  
Stress        N/mm2 : 5.08  
Allowable N/mm2 : 176.85  
Ratio            : 0.03  
Load combination : Max Range

Maximum occasional stress ratio

Point            : A07 F  
Stress        N/mm2 : 46.12  
Allowable N/mm2 : 141.48  
Ratio            : 0.33  
Load combination : Sus. + E3{1}

Maximum hoop stress ratio

Point            : A07 F  
Stress        N/mm2 : 17.02  
Allowable N/mm2 : 117.90  
Ratio            : 0.14  
Load combination : Max P{1}

## **LAMPIRAN J**

*GENERAL PIPE STRESS REPORT (OPERATING CONDITION  
WITHOUT EXPANSION JOINT, PIPE THICKNESS = 9,525 mm)*

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A02 N+	Max P{1}					( 3) HOOP	17.02	117.90
	GR + Max P{1}	7549			4.14	(15) SUST	13.58	117.90
	TR:Amb to T1{1}			71187	4.14	(17) DISP	94.43	176.85
	Amb to T1{1}			71187	4.14	(17) DISP	94.43	176.85
	Sus. + E1{1}	7549	3388		4.14	(16) OCC	16.95	141.48
	Sus. + E2{1}	7549	3388		4.14	(16) OCC	16.95	141.48
	Sus. + E3{1}	7549	4191		4.14	(16) OCC	17.75	141.48
	Sus. + E4{1}	7549	4191		4.14	(16) OCC	17.75	141.48
	Sus. + W1{1}	7549	3059		4.14	(16) OCC	16.62	141.48
	Sus. + W2{1}	7549	3059		4.14	(16) OCC	16.62	141.48
	Sus. + W3{1}	7549	3278		4.14	(16) OCC	16.84	141.48
	Sus. + W4{1}	7549	3278		4.14	(16) OCC	16.84	141.48
A04 N+	Max P{1}					( 3) HOOP	17.02	117.90
	GR + Max P{1}	10067			4.14	(15) SUST	16.08	117.90
	TR:Amb to T1{1}			40303	4.14	(17) DISP	53.46	176.85
	Amb to T1{1}			40303	4.14	(17) DISP	53.46	176.85
	Sus. + E1{1}	10067	5925		4.14	(16) OCC	21.98	141.48
	Sus. + E2{1}	10067	5925		4.14	(16) OCC	21.98	141.48
	Sus. + E3{1}	10067	2737		4.14	(16) OCC	18.81	141.48
	Sus. + E4{1}	10067	2737		4.14	(16) OCC	18.81	141.48
	Sus. + W1{1}	10067	6639		4.14	(16) OCC	22.69	141.48
	Sus. + W2{1}	10067	6639		4.14	(16) OCC	22.69	141.48
	Sus. + W3{1}	10067	2023		4.14	(16) OCC	18.10	141.48
	Sus. + W4{1}	10067	2023		4.14	(16) OCC	18.10	141.48
A07 N+	Max P{1}					( 3) HOOP	17.02	117.90
	GR + Max P{1}	12195			7.74	(15) SUST	28.72	117.90
	TR:Amb to T1{1}			20652	7.74	(17) DISP	51.16	176.85
	Amb to T1{1}			20652	7.74	(17) DISP	51.16	176.85
	Sus. + E1{1}	12195	1557		7.74	(16) OCC	31.62	141.48
	Sus. + E2{1}	12195	1557		7.74	(16) OCC	31.62	141.48
	Sus. + E3{1}	12195	2672		7.74	(16) OCC	33.69	141.48
	Sus. + E4{1}	12195	2672		7.74	(16) OCC	33.69	141.48
	Sus. + W1{1}	12195	2247		7.74	(16) OCC	32.90	141.48
	Sus. + W2{1}	12195	2247		7.74	(16) OCC	32.90	141.48
	Sus. + W3{1}	12195	2637		7.74	(16) OCC	33.62	141.48
	Sus. + W4{1}	12195	2637		7.74	(16) OCC	33.62	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A07 F-	Max P{1}					( 3) HOOP	17.02	117.90
	GR + Max P{1}	12995			7.74	(15) SUST	30.21	117.90
	TR:Amb to T1{1}			20035	7.74	(17) DISP	49.63	176.85
	Amb to T1{1}			20035	7.74	(17) DISP	49.63	176.85
	Sus. + E1{1}	12995	1637		7.74	(16) OCC	33.25	141.48
	Sus. + E2{1}	12995	1637		7.74	(16) OCC	33.25	141.48
	Sus. + E3{1}	12995	2371		7.74	(16) OCC	34.61	141.48
	Sus. + E4{1}	12995	2371		7.74	(16) OCC	34.61	141.48
	Sus. + W1{1}	12995	3034		7.74	(16) OCC	35.84	141.48
	Sus. + W2{1}	12995	3034		7.74	(16) OCC	35.84	141.48
	Sus. + W3{1}	12995	2335		7.74	(16) OCC	34.55	141.48
	Sus. + W4{1}	12995	2335		7.74	(16) OCC	34.55	141.48
A02 F-	Max P{1}					( 3) HOOP	17.02	117.90

GR + Max P{1}	10585		4.14	(15)	SUST	16.60	117.90
TR:Amb to T1{1}			33775	4.14	(17)	DISP	44.80 176.85
Amb to T1{1}			33775	4.14	(17)	DISP	44.80 176.85
Sus. + E1{1}	10585	2632	4.14	(16)	OCC	19.22	141.48
Sus. + E2{1}	10585	2632	4.14	(16)	OCC	19.22	141.48
Sus. + E3{1}	10585	4348	4.14	(16)	OCC	20.92	141.48
Sus. + E4{1}	10585	4348	4.14	(16)	OCC	20.92	141.48
Sus. + W1{1}	10585	2689	4.14	(16)	OCC	19.27	141.48
Sus. + W2{1}	10585	2689	4.14	(16)	OCC	19.27	141.48
Sus. + W3{1}	10585	3466	4.14	(16)	OCC	20.05	141.48
Sus. + W4{1}	10585	3466	4.14	(16)	OCC	20.05	141.48
A06 N+ Max P{1}							
GR + Max P{1}	13888			( 3)	HOOP	17.02	117.90
TR:Amb to T1{1}			14459	7.74	(15)	SUST	31.87 117.90
Amb to T1{1}			14459	7.74	(17)	DISP	35.82 176.85
Sus. + E1{1}	13888	4696	7.74	(16)	OCC	40.59	141.48
Sus. + E2{1}	13888	4696	7.74	(16)	OCC	40.59	141.48
Sus. + E3{1}	13888	3710	7.74	(16)	OCC	38.76	141.48
Sus. + E4{1}	13888	3710	7.74	(16)	OCC	38.76	141.48
Sus. + W1{1}	13888	5138	7.74	(16)	OCC	41.41	141.48
Sus. + W2{1}	13888	5138	7.74	(16)	OCC	41.41	141.48
Sus. + W3{1}	13888	4051	7.74	(16)	OCC	39.39	141.48
Sus. + W4{1}	13888	4051	7.74	(16)	OCC	39.39	141.48
A06 F- Max P{1}							
GR + Max P{1}	13961			( 3)	HOOP	17.02	117.90
TR:Amb to T1{1}			14200	7.74	(15)	SUST	32.00 117.90
Amb to T1{1}			14200	7.74	(17)	DISP	35.17 176.85
Sus. + E1{1}	13961	4686	7.74	(16)	OCC	40.71	141.48
Sus. + E2{1}	13961	4686	7.74	(16)	OCC	40.71	141.48
Sus. + E3{1}	13961	3857	7.74	(16)	OCC	39.17	141.48
Sus. + E4{1}	13961	3857	7.74	(16)	OCC	39.17	141.48
Sus. + W1{1}	13961	5047	7.74	(16)	OCC	41.38	141.48
Sus. + W2{1}	13961	5047	7.74	(16)	OCC	41.38	141.48
Sus. + W3{1}	13961	4189	7.74	(16)	OCC	39.79	141.48
Sus. + W4{1}	13961	4189	7.74	(16)	OCC	39.79	141.48

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		ASME B31.1 (2014) CODE COMPLIANCE						
		(Moments in N.m )		(Stress in N/mm2 )				
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.
A05 F- Max P{1}								
GR + Max P{1}		4671				( 3) HOOP	17.02	117.90
TR:Amb to T1{1}				29832	4.14	(15) SUST	10.71	117.90
Amb to T1{1}				29832	4.14	(17) DISP	39.57	176.85
Sus. + E1{1}		4671	4257		4.14	(17) DISP	39.57	176.85
Sus. + E2{1}		4671	4257		4.14	(16) OCC	14.95	141.48
Sus. + E3{1}		4671	1054		4.14	(16) OCC	11.76	141.48
Sus. + E4{1}		4671	1054		4.14	(16) OCC	11.76	141.48
Sus. + W1{1}		4671	4843		4.14	(16) OCC	15.53	141.48
Sus. + W2{1}		4671	4843		4.14	(16) OCC	15.53	141.48
Sus. + W3{1}		4671	928		4.14	(16) OCC	11.64	141.48
Sus. + W4{1}		4671	928		4.14	(16) OCC	11.64	141.48
A05 N+ Max P{1}								
GR + Max P{1}		3481				( 3) HOOP	17.02	117.90
TR:Amb to T1{1}				27888	4.14	(15) SUST	9.53	117.90
Amb to T1{1}				27888	4.14	(17) DISP	37.00	176.85
Sus. + E1{1}		3481	2761		4.14	(17) DISP	37.00	176.85
Sus. + E2{1}		3481	2761		4.14	(16) OCC	12.28	141.48
Sus. + E3{1}		3481	2307		4.14	(16) OCC	11.83	141.48
Sus. + E4{1}		3481	2307		4.14	(16) OCC	11.83	141.48
Sus. + W1{1}		3481	3052		4.14	(16) OCC	12.57	141.48
Sus. + W2{1}		3481	3052		4.14	(16) OCC	12.57	141.48
Sus. + W3{1}		3481	2515		4.14	(16) OCC	12.03	141.48
Sus. + W4{1}		3481	2515		4.14	(16) OCC	12.03	141.48
A09 F- Max P{1}								
GR + Max P{1}		23731				( 3) HOOP	17.02	117.90
TR:Amb to T1{1}				8419	4.14	(15) SUST	29.68	117.90
Amb to T1{1}				8419	4.14	(17) DISP	11.17	176.85
Sus. + E1{1}		23731	719		4.14	(17) DISP	11.17	176.85
					4.14	(16) OCC	30.39	141.48



Sus. + E2{1}	23731	719	4.14	(16)	OCC	30.39	141.48
Sus. + E3{1}	23731	1073	4.14	(16)	OCC	30.75	141.48
Sus. + E4{1}	23731	1073	4.14	(16)	OCC	30.75	141.48
Sus. + W1{1}	23731	2056	4.14	(16)	OCC	31.72	141.48
Sus. + W2{1}	23731	2056	4.14	(16)	OCC	31.72	141.48
Sus. + W3{1}	23731	1022	4.14	(16)	OCC	30.69	141.48
Sus. + W4{1}	23731	1022	4.14	(16)	OCC	30.69	141.48

A04 F- Max P{1}				( 3)	HOOP	17.02	117.90	
GR + Max P{1}	4399		4.14	(15)	SUST	10.44	117.90	
TR:Amb to T1{1}			23400	4.14	(17)	DISP	31.04	176.85
Amb to T1{1}			23400	4.14	(17)	DISP	31.04	176.85
Sus. + E1{1}	4399	3254	4.14	(16)	OCC	13.68	141.48	
Sus. + E2{1}	4399	3254	4.14	(16)	OCC	13.68	141.48	
Sus. + E3{1}	4399	2233	4.14	(16)	OCC	12.66	141.48	
Sus. + E4{1}	4399	2233	4.14	(16)	OCC	12.66	141.48	
Sus. + W1{1}	4399	3541	4.14	(16)	OCC	13.97	141.48	
Sus. + W2{1}	4399	3541	4.14	(16)	OCC	13.97	141.48	
Sus. + W3{1}	4399	1919	4.14	(16)	OCC	12.35	141.48	
Sus. + W4{1}	4399	1919	4.14	(16)	OCC	12.35	141.48	

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type		
A10 + Max P{1}						( 3) HOOP	17.02	117.90
GR + Max P{1}		65893			1.00	(15) SUST	27.16	117.90
TR:Amb to T1{1}				13795	1.00	(17) DISP	4.42	176.85
Amb to T1{1}				13795	1.00	(17) DISP	4.42	176.85
Sus. + E1{1}		65893	389		1.00	(16) OCC	27.28	141.48
Sus. + E2{1}		65893	389		1.00	(16) OCC	27.28	141.48
Sus. + E3{1}		65893	1022		1.00	(16) OCC	27.49	141.48
Sus. + E4{1}		65893	1022		1.00	(16) OCC	27.49	141.48
Sus. + W1{1}		65893	2002		1.00	(16) OCC	27.80	141.48
Sus. + W2{1}		65893	2002		1.00	(16) OCC	27.80	141.48
Sus. + W3{1}		65893	1123		1.00	(16) OCC	27.52	141.48
Sus. + W4{1}		65893	1123		1.00	(16) OCC	27.52	141.48
A10 - Max P{1}						( 3) HOOP	17.02	117.90
GR + Max P{1}		65893			1.00	(15) SUST	27.16	117.90
TR:Amb to T1{1}				13795	1.00	(17) DISP	4.42	176.85
Amb to T1{1}				13795	1.00	(17) DISP	4.42	176.85
Sus. + E1{1}		65893	389		1.00	(16) OCC	27.28	141.48
Sus. + E2{1}		65893	389		1.00	(16) OCC	27.28	141.48
Sus. + E3{1}		65893	1022		1.00	(16) OCC	27.49	141.48
Sus. + E4{1}		65893	1022		1.00	(16) OCC	27.49	141.48
Sus. + W1{1}		65893	2002		1.00	(16) OCC	27.80	141.48
Sus. + W2{1}		65893	2002		1.00	(16) OCC	27.80	141.48
Sus. + W3{1}		65893	1123		1.00	(16) OCC	27.52	141.48
Sus. + W4{1}		65893	1123		1.00	(16) OCC	27.52	141.48
A02 N- Max P{1}						( 3) HOOP	17.02	117.90
GR + Max P{1}		7549			1.00	(15) SUST	8.48	117.90
TR:Amb to T1{1}				71187	1.00	(17) DISP	22.79	176.85
Amb to T1{1}				71187	1.00	(17) DISP	22.79	176.85
Sus. + E1{1}		7549	3388		1.00	(16) OCC	9.57	141.48
Sus. + E2{1}		7549	3388		1.00	(16) OCC	9.57	141.48
Sus. + E3{1}		7549	4191		1.00	(16) OCC	9.82	141.48
Sus. + E4{1}		7549	4191		1.00	(16) OCC	9.82	141.48
Sus. + W1{1}		7549	3059		1.00	(16) OCC	9.46	141.48
Sus. + W2{1}		7549	3059		1.00	(16) OCC	9.46	141.48
Sus. + W3{1}		7549	3278		1.00	(16) OCC	9.53	141.48
Sus. + W4{1}		7549	3278		1.00	(16) OCC	9.53	141.48
A00 Max P{1}						( 3) HOOP	17.02	117.90
GR + Max P{1}		9558			1.00	(15) SUST	9.13	117.90
TR:Amb to T1{1}				70805	1.00	(17) DISP	22.66	176.85
Amb to T1{1}				70805	1.00	(17) DISP	22.66	176.85
Sus. + E1{1}		9558	7291		1.00	(16) OCC	11.46	141.48
Sus. + E2{1}		9558	7291		1.00	(16) OCC	11.46	141.48
Sus. + E3{1}		9558	7304		1.00	(16) OCC	11.46	141.48
Sus. + E4{1}		9558	7304		1.00	(16) OCC	11.46	141.48
Sus. + W1{1}		9558	6307		1.00	(16) OCC	11.15	141.48

Sus. + W2{1}	9558	6307	1.00	(16)	OCC	11.15	141.48
Sus. + W3{1}	9558	5565	1.00	(16)	OCC	10.91	141.48
Sus. + W4{1}	9558	5565	1.00	(16)	OCC	10.91	141.48

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ASME B31.1 (2014) CODE COMPLIANCE  
(Moments in N.m ) (Stress in N/mm2 )

Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.	
All F-	Max P{1}					( 3) HOOP	17.02	117.90	
	GR + Max P{1}	10961			4.14	(15) SUST	16.97	117.90	
	TR:Amb to Tl{1}			6091	4.14	(17) DISP	8.08	176.85	
	Amb to Tl{1}			6091	4.14	(17) DISP	8.08	176.85	
	Sus. + E1{1}	10961	2461		4.14	(16) OCC	19.42	141.48	
	Sus. + E2{1}	10961	2461		4.14	(16) OCC	19.42	141.48	
	Sus. + E3{1}	10961	2767		4.14	(16) OCC	19.73	141.48	
	Sus. + E4{1}	10961	2767		4.14	(16) OCC	19.73	141.48	
	Sus. + W1{1}	10961	5593		4.14	(16) OCC	22.54	141.48	
	Sus. + W2{1}	10961	5593		4.14	(16) OCC	22.54	141.48	
	Sus. + W3{1}	10961	3111		4.14	(16) OCC	20.07	141.48	
	Sus. + W4{1}	10961	3111		4.14	(16) OCC	20.07	141.48	
	A03 +	Max P{1}					( 3) HOOP	17.02	117.90
		GR + Max P{1}	27009			1.00	(15) SUST	14.71	117.90
TR:Amb to Tl{1}				67460	1.00	(17) DISP	21.59	176.85	
Amb to Tl{1}				67460	1.00	(17) DISP	21.59	176.85	
Sus. + E1{1}		27009	5298		1.00	(16) OCC	16.41	141.48	
Sus. + E2{1}		27009	5298		1.00	(16) OCC	16.41	141.48	
Sus. + E3{1}		27009	12805		1.00	(16) OCC	18.81	141.48	
Sus. + E4{1}		27009	12805		1.00	(16) OCC	18.81	141.48	
Sus. + W1{1}		27009	6019		1.00	(16) OCC	16.64	141.48	
Sus. + W2{1}		27009	6019		1.00	(16) OCC	16.64	141.48	
Sus. + W3{1}		27009	10511		1.00	(16) OCC	18.08	141.48	
Sus. + W4{1}		27009	10511		1.00	(16) OCC	18.08	141.48	
A03 -		Max P{1}					( 3) HOOP	17.02	117.90
		GR + Max P{1}	27009			1.00	(15) SUST	14.71	117.90
	TR:Amb to Tl{1}			67460	1.00	(17) DISP	21.59	176.85	
	Amb to Tl{1}			67460	1.00	(17) DISP	21.59	176.85	
	Sus. + E1{1}	27009	5298		1.00	(16) OCC	16.41	141.48	
	Sus. + E2{1}	27009	5298		1.00	(16) OCC	16.41	141.48	
	Sus. + E3{1}	27009	12805		1.00	(16) OCC	18.81	141.48	
	Sus. + E4{1}	27009	12805		1.00	(16) OCC	18.81	141.48	
	Sus. + W1{1}	27009	6019		1.00	(16) OCC	16.64	141.48	
	Sus. + W2{1}	27009	6019		1.00	(16) OCC	16.64	141.48	
	Sus. + W3{1}	27009	10511		1.00	(16) OCC	18.08	141.48	
	Sus. + W4{1}	27009	10511		1.00	(16) OCC	18.08	141.48	
	A09 N+	Max P{1}					( 3) HOOP	17.02	117.90
		GR + Max P{1}	12988			4.14	(15) SUST	18.99	117.90
TR:Amb to Tl{1}				10822	4.14	(17) DISP	14.36	176.85	
Amb to Tl{1}				10822	4.14	(17) DISP	14.36	176.85	
Sus. + E1{1}		12988	1583		4.14	(16) OCC	20.56	141.48	
Sus. + E2{1}		12988	1583		4.14	(16) OCC	20.56	141.48	
Sus. + E3{1}		12988	1040		4.14	(16) OCC	20.02	141.48	
Sus. + E4{1}		12988	1040		4.14	(16) OCC	20.02	141.48	
Sus. + W1{1}		12988	1007		4.14	(16) OCC	19.99	141.48	
Sus. + W2{1}		12988	1007		4.14	(16) OCC	19.99	141.48	
Sus. + W3{1}		12988	1184		4.14	(16) OCC	20.17	141.48	
Sus. + W4{1}		12988	1184		4.14	(16) OCC	20.17	141.48	

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(Moments in N.m ) (Stress in N/mm2 )

Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.
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name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no.	type	Stress	Allow.
A14 F-	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	4830			4.14	(15)	SUST	10.87	117.90
	TR:Amb to T1{1}			3055	4.14	(17)	DISP	4.05	176.85
	Amb to T1{1}			3055	4.14	(17)	DISP	4.05	176.85
	Sus. + E1{1}	4830	5474		4.14	(16)	OCC	16.32	141.48
	Sus. + E2{1}	4830	5474		4.14	(16)	OCC	16.32	141.48
	Sus. + E3{1}	4830	2730		4.14	(16)	OCC	13.59	141.48
	Sus. + E4{1}	4830	2730		4.14	(16)	OCC	13.59	141.48
	Sus. + W1{1}	4830	8746		4.14	(16)	OCC	19.57	141.48
	Sus. + W2{1}	4830	8746		4.14	(16)	OCC	19.57	141.48
	Sus. + W3{1}	4830	4161		4.14	(16)	OCC	15.01	141.48
	Sus. + W4{1}	4830	4161		4.14	(16)	OCC	15.01	141.48
A08 +	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	10249			1.00	(15)	SUST	9.35	117.90
	TR:Amb to T1{1}			32049	1.00	(17)	DISP	10.26	176.85
	Amb to T1{1}			32049	1.00	(17)	DISP	10.26	176.85
	Sus. + E1{1}	10249	19886		1.00	(16)	OCC	15.71	141.48
	Sus. + E2{1}	10249	19886		1.00	(16)	OCC	15.71	141.48
	Sus. + E3{1}	10249	12819		1.00	(16)	OCC	13.45	141.48
	Sus. + E4{1}	10249	12819		1.00	(16)	OCC	13.45	141.48
	Sus. + W1{1}	10249	28678		1.00	(16)	OCC	18.53	141.48
	Sus. + W2{1}	10249	28678		1.00	(16)	OCC	18.53	141.48
	Sus. + W3{1}	10249	13988		1.00	(16)	OCC	13.82	141.48
	Sus. + W4{1}	10249	13988		1.00	(16)	OCC	13.82	141.48
A08 -	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	10249			1.00	(15)	SUST	9.35	117.90
	TR:Amb to T1{1}			32049	1.00	(17)	DISP	10.26	176.85
	Amb to T1{1}			32049	1.00	(17)	DISP	10.26	176.85
	Sus. + E1{1}	10249	19886		1.00	(16)	OCC	15.71	141.48
	Sus. + E2{1}	10249	19886		1.00	(16)	OCC	15.71	141.48
	Sus. + E3{1}	10249	12819		1.00	(16)	OCC	13.45	141.48
	Sus. + E4{1}	10249	12819		1.00	(16)	OCC	13.45	141.48
	Sus. + W1{1}	10249	28678		1.00	(16)	OCC	18.53	141.48
	Sus. + W2{1}	10249	28678		1.00	(16)	OCC	18.53	141.48
	Sus. + W3{1}	10249	13988		1.00	(16)	OCC	13.82	141.48
	Sus. + W4{1}	10249	13988		1.00	(16)	OCC	13.82	141.48
A11 N+	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	8094			4.14	(15)	SUST	14.12	117.90
	TR:Amb to T1{1}			9148	4.14	(17)	DISP	12.14	176.85
	Amb to T1{1}			9148	4.14	(17)	DISP	12.14	176.85
	Sus. + E1{1}	8094	1064		4.14	(16)	OCC	15.18	141.48
	Sus. + E2{1}	8094	1064		4.14	(16)	OCC	15.18	141.48
	Sus. + E3{1}	8094	607		4.14	(16)	OCC	14.72	141.48
	Sus. + E4{1}	8094	607		4.14	(16)	OCC	14.72	141.48
	Sus. + W1{1}	8094	3046		4.14	(16)	OCC	17.15	141.48
	Sus. + W2{1}	8094	3046		4.14	(16)	OCC	17.15	141.48
	Sus. + W3{1}	8094	1240		4.14	(16)	OCC	15.35	141.48
	Sus. + W4{1}	8094	1240		4.14	(16)	OCC	15.35	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. no.	Load type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )						
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)					
A15	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	3085			1.00	(15)	SUST	7.05	117.90
	TR:Amb to T1{1}			3415	1.00	(17)	DISP	1.09	176.85
	Amb to T1{1}			3415	1.00	(17)	DISP	1.09	176.85
	Sus. + E1{1}	3085	12070		1.00	(16)	OCC	10.92	141.48
	Sus. + E2{1}	3085	12070		1.00	(16)	OCC	10.92	141.48
	Sus. + E3{1}	3085	11930		1.00	(16)	OCC	10.87	141.48
	Sus. + E4{1}	3085	11930		1.00	(16)	OCC	10.87	141.48
	Sus. + W1{1}	3085	21832		1.00	(16)	OCC	14.04	141.48
	Sus. + W2{1}	3085	21832		1.00	(16)	OCC	14.04	141.48
	Sus. + W3{1}	3085	17142		1.00	(16)	OCC	12.54	141.48
	Sus. + W4{1}	3085	17142		1.00	(16)	OCC	12.54	141.48
A14 F+	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	4830			1.00	(15)	SUST	7.61	117.90

TR:Amb to T1{1}			3055	1.00	(17)	DISP	0.98	176.85
Amb to T1{1}			3055	1.00	(17)	DISP	0.98	176.85
Sus. + E1{1}	4830	5474		1.00	(16)	OCC	9.36	141.48
Sus. + E2{1}	4830	5474		1.00	(16)	OCC	9.36	141.48
Sus. + E3{1}	4830	2730		1.00	(16)	OCC	8.49	141.48
Sus. + E4{1}	4830	2730		1.00	(16)	OCC	8.49	141.48
Sus. + W1{1}	4830	8746		1.00	(16)	OCC	10.41	141.48
Sus. + W2{1}	4830	8746		1.00	(16)	OCC	10.41	141.48
Sus. + W3{1}	4830	4161		1.00	(16)	OCC	8.94	141.48
Sus. + W4{1}	4830	4161		1.00	(16)	OCC	8.94	141.48
A14 N+ Max P{1}								
GR + Max P{1}	1949			4.14	(15)	SUST	8.01	117.90
TR:Amb to T1{1}			2202	4.14	(17)	DISP	2.92	176.85
Amb to T1{1}			2202	4.14	(17)	DISP	2.92	176.85
Sus. + E1{1}	1949	4125		4.14	(16)	OCC	12.11	141.48
Sus. + E2{1}	1949	4125		4.14	(16)	OCC	12.11	141.48
Sus. + E3{1}	1949	2227		4.14	(16)	OCC	10.22	141.48
Sus. + E4{1}	1949	2227		4.14	(16)	OCC	10.22	141.48
Sus. + W1{1}	1949	6087		4.14	(16)	OCC	14.06	141.48
Sus. + W2{1}	1949	6087		4.14	(16)	OCC	14.06	141.48
Sus. + W3{1}	1949	3549		4.14	(16)	OCC	11.54	141.48
Sus. + W4{1}	1949	3549		4.14	(16)	OCC	11.54	141.48
A14 N- Max P{1}								
GR + Max P{1}	1949			1.00	(15)	SUST	6.69	117.90
TR:Amb to T1{1}			2202	1.00	(17)	DISP	0.70	176.85
Amb to T1{1}			2202	1.00	(17)	DISP	0.70	176.85
Sus. + E1{1}	1949	4125		1.00	(16)	OCC	8.01	141.48
Sus. + E2{1}	1949	4125		1.00	(16)	OCC	8.01	141.48
Sus. + E3{1}	1949	2227		1.00	(16)	OCC	7.40	141.48
Sus. + E4{1}	1949	2227		1.00	(16)	OCC	7.40	141.48
Sus. + W1{1}	1949	6087		1.00	(16)	OCC	8.64	141.48
Sus. + W2{1}	1949	6087		1.00	(16)	OCC	8.64	141.48
Sus. + W3{1}	1949	3549		1.00	(16)	OCC	7.83	141.48
Sus. + W4{1}	1949	3549		1.00	(16)	OCC	7.83	141.48

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ASME B31.1 (2014) CODE COMPLIANCE								
(Moments in N.m )			(Stress in N/mm2 )					
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.
A13 F+ Max P{1}								
GR + Max P{1}		5317			1.00	(15) SUST	7.77	117.90
TR:Amb to T1{1}				3667	1.00	(17) DISP	1.17	176.85
Amb to T1{1}				3667	1.00	(17) DISP	1.17	176.85
Sus. + E1{1}		5317	3097		1.00	(16) OCC	8.76	141.48
Sus. + E2{1}		5317	3097		1.00	(16) OCC	8.76	141.48
Sus. + E3{1}		5317	1419		1.00	(16) OCC	8.22	141.48
Sus. + E4{1}		5317	1419		1.00	(16) OCC	8.22	141.48
Sus. + W1{1}		5317	5684		1.00	(16) OCC	9.59	141.48
Sus. + W2{1}		5317	5684		1.00	(16) OCC	9.59	141.48
Sus. + W3{1}		5317	2063		1.00	(16) OCC	8.43	141.48
Sus. + W4{1}		5317	2063		1.00	(16) OCC	8.43	141.48
A13 F- Max P{1}								
GR + Max P{1}		5317			4.14	(15) SUST	11.36	117.90
TR:Amb to T1{1}				3667	4.14	(17) DISP	4.86	176.85
Amb to T1{1}				3667	4.14	(17) DISP	4.86	176.85
Sus. + E1{1}		5317	3097		4.14	(16) OCC	14.44	141.48
Sus. + E2{1}		5317	3097		4.14	(16) OCC	14.44	141.48
Sus. + E3{1}		5317	1419		4.14	(16) OCC	12.77	141.48
Sus. + E4{1}		5317	1419		4.14	(16) OCC	12.77	141.48
Sus. + W1{1}		5317	5684		4.14	(16) OCC	17.01	141.48
Sus. + W2{1}		5317	5684		4.14	(16) OCC	17.01	141.48
Sus. + W3{1}		5317	2063		4.14	(16) OCC	13.41	141.48
Sus. + W4{1}		5317	2063		4.14	(16) OCC	13.41	141.48
A13 N+ Max P{1}								
GR + Max P{1}		2485			4.14	(15) SUST	8.54	117.90
TR:Amb to T1{1}				4630	4.14	(17) DISP	6.14	176.85
Amb to T1{1}				4630	4.14	(17) DISP	6.14	176.85
Sus. + E1{1}		2485	4031		4.14	(16) OCC	12.55	141.48
Sus. + E2{1}		2485	4031		4.14	(16) OCC	12.55	141.48

Sus. + E3{1}	2485	1764	4.14	(16)	OCC	10.29	141.48
Sus. + E4{1}	2485	1764	4.14	(16)	OCC	10.29	141.48
Sus. + W1{1}	2485	7576	4.14	(16)	OCC	16.08	141.48
Sus. + W2{1}	2485	7576	4.14	(16)	OCC	16.08	141.48
Sus. + W3{1}	2485	2845	4.14	(16)	OCC	11.37	141.48
Sus. + W4{1}	2485	2845	4.14	(16)	OCC	11.37	141.48

A13 N- Max P{1}				( 3)	HOOP	17.02	117.90
GR + Max P{1}	2485			1.00	(15) SUST	6.86	117.90
TR:Amb to T1{1}			4630	1.00	(17) DISP	1.48	176.85
Amb to T1{1}			4630	1.00	(17) DISP	1.48	176.85
Sus. + E1{1}	2485	4031		1.00	(16) OCC	8.15	141.48
Sus. + E2{1}	2485	4031		1.00	(16) OCC	8.15	141.48
Sus. + E3{1}	2485	1764		1.00	(16) OCC	7.43	141.48
Sus. + E4{1}	2485	1764		1.00	(16) OCC	7.43	141.48
Sus. + W1{1}	2485	7576		1.00	(16) OCC	9.29	141.48
Sus. + W2{1}	2485	7576		1.00	(16) OCC	9.29	141.48
Sus. + W3{1}	2485	2845		1.00	(16) OCC	7.77	141.48
Sus. + W4{1}	2485	2845		1.00	(16) OCC	7.77	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			Eq. no.	Load type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )					
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F			
A12 + Max P{1}						( 3) HOOP	17.02	117.90
GR + Max P{1}		11317			1.00	(15) SUST	9.69	117.90
TR:Amb to T1{1}				6180	1.00	(17) DISP	1.98	176.85
Amb to T1{1}				6180	1.00	(17) DISP	1.98	176.85
Sus. + E1{1}		11317	2546		1.00	(16) OCC	10.50	141.48
Sus. + E2{1}		11317	2546		1.00	(16) OCC	10.50	141.48
Sus. + E3{1}		11317	3035		1.00	(16) OCC	10.66	141.48
Sus. + E4{1}		11317	3035		1.00	(16) OCC	10.66	141.48
Sus. + W1{1}		11317	5712		1.00	(16) OCC	11.52	141.48
Sus. + W2{1}		11317	5712		1.00	(16) OCC	11.52	141.48
Sus. + W3{1}		11317	3304		1.00	(16) OCC	10.75	141.48
Sus. + W4{1}		11317	3304		1.00	(16) OCC	10.75	141.48
A12 - Max P{1}						( 3) HOOP	17.02	117.90
GR + Max P{1}		11317			1.00	(15) SUST	9.69	117.90
TR:Amb to T1{1}				6180	1.00	(17) DISP	1.98	176.85
Amb to T1{1}				6180	1.00	(17) DISP	1.98	176.85
Sus. + E1{1}		11317	2546		1.00	(16) OCC	10.50	141.48
Sus. + E2{1}		11317	2546		1.00	(16) OCC	10.50	141.48
Sus. + E3{1}		11317	3035		1.00	(16) OCC	10.66	141.48
Sus. + E4{1}		11317	3035		1.00	(16) OCC	10.66	141.48
Sus. + W1{1}		11317	5712		1.00	(16) OCC	11.52	141.48
Sus. + W2{1}		11317	5712		1.00	(16) OCC	11.52	141.48
Sus. + W3{1}		11317	3304		1.00	(16) OCC	10.75	141.48
Sus. + W4{1}		11317	3304		1.00	(16) OCC	10.75	141.48
A11 F+ Max P{1}						( 3) HOOP	17.02	117.90
GR + Max P{1}		10961			1.00	(15) SUST	9.58	117.90
TR:Amb to T1{1}				6091	1.00	(17) DISP	1.95	176.85
Amb to T1{1}				6091	1.00	(17) DISP	1.95	176.85
Sus. + E1{1}		10961	2461		1.00	(16) OCC	10.36	141.48
Sus. + E2{1}		10961	2461		1.00	(16) OCC	10.36	141.48
Sus. + E3{1}		10961	2767		1.00	(16) OCC	10.46	141.48
Sus. + E4{1}		10961	2767		1.00	(16) OCC	10.46	141.48
Sus. + W1{1}		10961	5593		1.00	(16) OCC	11.37	141.48
Sus. + W2{1}		10961	5593		1.00	(16) OCC	11.37	141.48
Sus. + W3{1}		10961	3111		1.00	(16) OCC	10.57	141.48
Sus. + W4{1}		10961	3111		1.00	(16) OCC	10.57	141.48
A11 N- Max P{1}						( 3) HOOP	17.02	117.90
GR + Max P{1}		8094			1.00	(15) SUST	8.66	117.90
TR:Amb to T1{1}				9148	1.00	(17) DISP	2.93	176.85
Amb to T1{1}				9148	1.00	(17) DISP	2.93	176.85
Sus. + E1{1}		8094	1064		1.00	(16) OCC	9.00	141.48
Sus. + E2{1}		8094	1064		1.00	(16) OCC	9.00	141.48
Sus. + E3{1}		8094	607		1.00	(16) OCC	8.85	141.48
Sus. + E4{1}		8094	607		1.00	(16) OCC	8.85	141.48
Sus. + W1{1}		8094	3046		1.00	(16) OCC	9.63	141.48
Sus. + W2{1}		8094	3046		1.00	(16) OCC	9.63	141.48

Sus. + W3{1}	8094	1240	1.00	(16)	OCC	9.05	141.48
Sus. + W4{1}	8094	1240	1.00	(16)	OCC	9.05	141.48

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		ASME B31.1 (2014)		CODE COMPLIANCE			
		(Moments in N.m )		(Stress in N/mm2 )			
Point	Load	Ma	Mb	Mc	Eq. Load	Code	Code
name	combination	(Sus.)	(Occ.)	(Exp.)	no. type	Stress	Allow.
A09 F+	Max P{1}				( 3) HOOP	17.02	117.90
	GR + Max P{1}	23731			(15) SUST	13.66	117.90
	TR:Amb to T1{1}			8419	(17) DISP	2.69	176.85
	Amb to T1{1}			8419	(17) DISP	2.69	176.85
	Sus. + E1{1}	23731	719		(16) OCC	13.89	141.48
	Sus. + E2{1}	23731	719		(16) OCC	13.89	141.48
	Sus. + E3{1}	23731	1073		(16) OCC	14.01	141.48
	Sus. + E4{1}	23731	1073		(16) OCC	14.01	141.48
	Sus. + W1{1}	23731	2056		(16) OCC	14.32	141.48
	Sus. + W2{1}	23731	2056		(16) OCC	14.32	141.48
	Sus. + W3{1}	23731	1022		(16) OCC	13.99	141.48
	Sus. + W4{1}	23731	1022		(16) OCC	13.99	141.48
A09 N-	Max P{1}				( 3) HOOP	17.02	117.90
	GR + Max P{1}	12988			(15) SUST	10.22	117.90
	TR:Amb to T1{1}			10822	(17) DISP	3.46	176.85
	Amb to T1{1}			10822	(17) DISP	3.46	176.85
	Sus. + E1{1}	12988	1583		(16) OCC	10.73	141.48
	Sus. + E2{1}	12988	1583		(16) OCC	10.73	141.48
	Sus. + E3{1}	12988	1040		(16) OCC	10.56	141.48
	Sus. + E4{1}	12988	1040		(16) OCC	10.56	141.48
	Sus. + W1{1}	12988	1007		(16) OCC	10.55	141.48
	Sus. + W2{1}	12988	1007		(16) OCC	10.55	141.48
	Sus. + W3{1}	12988	1184		(16) OCC	10.60	141.48
	Sus. + W4{1}	12988	1184		(16) OCC	10.60	141.48
A07 F+	Max P{1}				( 3) HOOP	17.02	117.90
	GR + Max P{1}	12995			(15) SUST	10.23	117.90
	TR:Amb to T1{1}			20035	(17) DISP	6.41	176.85
	Amb to T1{1}			20035	(17) DISP	6.41	176.85
	Sus. + E1{1}	12995	1637		(16) OCC	10.75	141.48
	Sus. + E2{1}	12995	1637		(16) OCC	10.75	141.48
	Sus. + E3{1}	12995	2371		(16) OCC	10.99	141.48
	Sus. + E4{1}	12995	2371		(16) OCC	10.99	141.48
	Sus. + W1{1}	12995	3034		(16) OCC	11.20	141.48
	Sus. + W2{1}	12995	3034		(16) OCC	11.20	141.48
	Sus. + W3{1}	12995	2335		(16) OCC	10.97	141.48
	Sus. + W4{1}	12995	2335		(16) OCC	10.97	141.48
A07 N-	Max P{1}				( 3) HOOP	17.02	117.90
	GR + Max P{1}	12195			(15) SUST	9.97	117.90
	TR:Amb to T1{1}			20652	(17) DISP	6.61	176.85
	Amb to T1{1}			20652	(17) DISP	6.61	176.85
	Sus. + E1{1}	12195	1557		(16) OCC	10.47	141.48
	Sus. + E2{1}	12195	1557		(16) OCC	10.47	141.48
	Sus. + E3{1}	12195	2672		(16) OCC	10.83	141.48
	Sus. + E4{1}	12195	2672		(16) OCC	10.83	141.48
	Sus. + W1{1}	12195	2247		(16) OCC	10.69	141.48
	Sus. + W2{1}	12195	2247		(16) OCC	10.69	141.48
	Sus. + W3{1}	12195	2637		(16) OCC	10.81	141.48
	Sus. + W4{1}	12195	2637		(16) OCC	10.81	141.48

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		ASME B31.1 (2014)		CODE COMPLIANCE			
		(Moments in N.m )		(Stress in N/mm2 )			
Point	Load	Ma	Mb	Mc	Eq. Load	Code	Code
name	combination	(Sus.)	(Occ.)	(Exp.)	no. type	Stress	Allow.

-----									
A06 F+	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	13961			1.00	(15)	SUST	10.54	117.90
	TR:Amb to T1{1}			14200	1.00	(17)	DISP	4.55	176.85
	Amb to T1{1}			14200	1.00	(17)	DISP	4.55	176.85
	Sus. + E1{1}	13961	4686		1.00	(16)	OCC	12.04	141.48
	Sus. + E2{1}	13961	4686		1.00	(16)	OCC	12.04	141.48
	Sus. + E3{1}	13961	3857		1.00	(16)	OCC	11.77	141.48
	Sus. + E4{1}	13961	3857		1.00	(16)	OCC	11.77	141.48
	Sus. + W1{1}	13961	5047		1.00	(16)	OCC	12.15	141.48
	Sus. + W2{1}	13961	5047		1.00	(16)	OCC	12.15	141.48
	Sus. + W3{1}	13961	4189		1.00	(16)	OCC	11.88	141.48
	Sus. + W4{1}	13961	4189		1.00	(16)	OCC	11.88	141.48
A06 N-	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	13888			1.00	(15)	SUST	10.51	117.90
	TR:Amb to T1{1}			14459	1.00	(17)	DISP	4.63	176.85
	Amb to T1{1}			14459	1.00	(17)	DISP	4.63	176.85
	Sus. + E1{1}	13888	4696		1.00	(16)	OCC	12.02	141.48
	Sus. + E2{1}	13888	4696		1.00	(16)	OCC	12.02	141.48
	Sus. + E3{1}	13888	3710		1.00	(16)	OCC	11.70	141.48
	Sus. + E4{1}	13888	3710		1.00	(16)	OCC	11.70	141.48
	Sus. + W1{1}	13888	5138		1.00	(16)	OCC	12.16	141.48
	Sus. + W2{1}	13888	5138		1.00	(16)	OCC	12.16	141.48
	Sus. + W3{1}	13888	4051		1.00	(16)	OCC	11.81	141.48
	Sus. + W4{1}	13888	4051		1.00	(16)	OCC	11.81	141.48
A05 F+	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	4671			1.00	(15)	SUST	7.56	117.90
	TR:Amb to T1{1}			29832	1.00	(17)	DISP	9.55	176.85
	Amb to T1{1}			29832	1.00	(17)	DISP	9.55	176.85
	Sus. + E1{1}	4671	4257		1.00	(16)	OCC	8.92	141.48
	Sus. + E2{1}	4671	4257		1.00	(16)	OCC	8.92	141.48
	Sus. + E3{1}	4671	1054		1.00	(16)	OCC	7.90	141.48
	Sus. + E4{1}	4671	1054		1.00	(16)	OCC	7.90	141.48
	Sus. + W1{1}	4671	4843		1.00	(16)	OCC	9.11	141.48
	Sus. + W2{1}	4671	4843		1.00	(16)	OCC	9.11	141.48
	Sus. + W3{1}	4671	928		1.00	(16)	OCC	7.86	141.48
	Sus. + W4{1}	4671	928		1.00	(16)	OCC	7.86	141.48
A05 N-	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	3481			1.00	(15)	SUST	7.18	117.90
	TR:Amb to T1{1}			27888	1.00	(17)	DISP	8.93	176.85
	Amb to T1{1}			27888	1.00	(17)	DISP	8.93	176.85
	Sus. + E1{1}	3481	2761		1.00	(16)	OCC	8.06	141.48
	Sus. + E2{1}	3481	2761		1.00	(16)	OCC	8.06	141.48
	Sus. + E3{1}	3481	2307		1.00	(16)	OCC	7.92	141.48
	Sus. + E4{1}	3481	2307		1.00	(16)	OCC	7.92	141.48
	Sus. + W1{1}	3481	3052		1.00	(16)	OCC	8.16	141.48
	Sus. + W2{1}	3481	3052		1.00	(16)	OCC	8.16	141.48
	Sus. + W3{1}	3481	2515		1.00	(16)	OCC	7.99	141.48
	Sus. + W4{1}	3481	2515		1.00	(16)	OCC	7.99	141.48
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ASME B31.1 (2014) CODE COMPLIANCE									
(Moments in N.m ) (Stress in N/mm2 )									
Point	Load	Ma	Mb	Mc	S.I.F	Eq. Load	Code	Code	
name	combination	(Sus.)	(Occ.)	(Exp.)		no. type	Stress	Allow.	
-----									
A04 F+	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	4399			1.00	(15)	SUST	7.47	117.90
	TR:Amb to T1{1}			23400	1.00	(17)	DISP	7.49	176.85
	Amb to T1{1}			23400	1.00	(17)	DISP	7.49	176.85
	Sus. + E1{1}	4399	3254		1.00	(16)	OCC	8.52	141.48
	Sus. + E2{1}	4399	3254		1.00	(16)	OCC	8.52	141.48
	Sus. + E3{1}	4399	2233		1.00	(16)	OCC	8.19	141.48
	Sus. + E4{1}	4399	2233		1.00	(16)	OCC	8.19	141.48
	Sus. + W1{1}	4399	3541		1.00	(16)	OCC	8.61	141.48
	Sus. + W2{1}	4399	3541		1.00	(16)	OCC	8.61	141.48
	Sus. + W3{1}	4399	1919		1.00	(16)	OCC	8.09	141.48
	Sus. + W4{1}	4399	1919		1.00	(16)	OCC	8.09	141.48
A04 N-	Max P{1}					( 3)	HOOP	17.02	117.90
	GR + Max P{1}	10067			1.00	(15)	SUST	9.29	117.90
	TR:Amb to T1{1}			40303	1.00	(17)	DISP	12.90	176.85
-----									

Amb to T1{1}			40303	1.00	(17)	DISP	12.90	176.85
Sus. + E1{1}	10067	5925		1.00	(16)	OCC	11.19	141.48
Sus. + E2{1}	10067	5925		1.00	(16)	OCC	11.19	141.48
Sus. + E3{1}	10067	2737		1.00	(16)	OCC	10.16	141.48
Sus. + E4{1}	10067	2737		1.00	(16)	OCC	10.16	141.48
Sus. + W1{1}	10067	6639		1.00	(16)	OCC	11.41	141.48
Sus. + W2{1}	10067	6639		1.00	(16)	OCC	11.41	141.48
Sus. + W3{1}	10067	2023		1.00	(16)	OCC	9.94	141.48
Sus. + W4{1}	10067	2023		1.00	(16)	OCC	9.94	141.48
-----								
A02 F+ Max P{1}					( 3)	HOOP	17.02	117.90
GR + Max P{1}	10585			1.00	(15)	SUST	9.45	117.90
TR:Amb to T1{1}			33775	1.00	(17)	DISP	10.81	176.85
Amb to T1{1}			33775	1.00	(17)	DISP	10.81	176.85
Sus. + E1{1}	10585	2632		1.00	(16)	OCC	10.30	141.48
Sus. + E2{1}	10585	2632		1.00	(16)	OCC	10.30	141.48
Sus. + E3{1}	10585	4348		1.00	(16)	OCC	10.85	141.48
Sus. + E4{1}	10585	4348		1.00	(16)	OCC	10.85	141.48
Sus. + W1{1}	10585	2689		1.00	(16)	OCC	10.32	141.48
Sus. + W2{1}	10585	2689		1.00	(16)	OCC	10.32	141.48
Sus. + W3{1}	10585	3466		1.00	(16)	OCC	10.56	141.48
Sus. + W4{1}	10585	3466		1.00	(16)	OCC	10.56	141.48

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R E S U L T S U M M A R Y

Maximum sustained stress ratio

Point : A06 F  
Stress N/mm2 : 32.00  
Allowable N/mm2 : 117.90  
Ratio : 0.27  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A02 N  
Stress N/mm2 : 94.43  
Allowable N/mm2 : 176.85  
Ratio : 0.53  
Load combination : Max Range

Maximum occasional stress ratio

Point : A06 N  
Stress N/mm2 : 41.41  
Allowable N/mm2 : 141.48  
Ratio : 0.29  
Load combination : Sus. + W1{1}

Maximum hoop stress ratio

Point : A02 N  
Stress N/mm2 : 17.02  
Allowable N/mm2 : 117.90  
Ratio : 0.14  
Load combination : Max P{1}



## **LAMPIRAN K**

*GENERAL PIPE STRESS REPORT (OPERATING CONDITION WITH  
EXPANSION JOINT, PIPE THICKNESS = 8,808 mm)*

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A07 F-	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	16469			8.08	(15) SUST	41.00	117.90
	TR:Amb to T1{1}			1964	8.08	(17) DISP	5.48	176.85
	Amb to T1{1}			1964	8.08	(17) DISP	5.48	176.85
	Sus. + E1{1}	16469	1302		8.08	(16) OCC	43.72	141.48
	Sus. + E2{1}	16469	1302		8.08	(16) OCC	43.72	141.48
	Sus. + E3{1}	16469	3479		8.08	(16) OCC	48.28	141.48
	Sus. + E4{1}	16469	3479		8.08	(16) OCC	48.28	141.48
	Sus. + W1{1}	16469	3182		8.08	(16) OCC	47.66	141.48
	Sus. + W2{1}	16469	3182		8.08	(16) OCC	47.66	141.48
	Sus. + W3{1}	16469	3041		8.08	(16) OCC	47.36	141.48
	Sus. + W4{1}	16469	3041		8.08	(16) OCC	47.36	141.48
A07 N+	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	15782			8.08	(15) SUST	39.57	117.90
	TR:Amb to T1{1}			2006	8.08	(17) DISP	5.59	176.85
	Amb to T1{1}			2006	8.08	(17) DISP	5.59	176.85
	Sus. + E1{1}	15782	1543		8.08	(16) OCC	42.79	141.48
	Sus. + E2{1}	15782	1543		8.08	(16) OCC	42.79	141.48
	Sus. + E3{1}	15782	3611		8.08	(16) OCC	47.12	141.48
	Sus. + E4{1}	15782	3611		8.08	(16) OCC	47.12	141.48
	Sus. + W1{1}	15782	2294		8.08	(16) OCC	44.36	141.48
	Sus. + W2{1}	15782	2294		8.08	(16) OCC	44.36	141.48
	Sus. + W3{1}	15782	3248		8.08	(16) OCC	46.36	141.48
	Sus. + W4{1}	15782	3248		8.08	(16) OCC	46.36	141.48
A06 N+	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	13143			8.08	(15) SUST	34.05	117.90
	TR:Amb to T1{1}			1887	8.08	(17) DISP	5.26	176.85
	Amb to T1{1}			1887	8.08	(17) DISP	5.26	176.85
	Sus. + E1{1}	13143	4997		8.08	(16) OCC	44.50	141.48
	Sus. + E2{1}	13143	4997		8.08	(16) OCC	44.50	141.48
	Sus. + E3{1}	13143	3920		8.08	(16) OCC	42.24	141.48
	Sus. + E4{1}	13143	3920		8.08	(16) OCC	42.24	141.48
	Sus. + W1{1}	13143	5248		8.08	(16) OCC	45.02	141.48
	Sus. + W2{1}	13143	5248		8.08	(16) OCC	45.02	141.48
	Sus. + W3{1}	13143	4022		8.08	(16) OCC	42.46	141.48
	Sus. + W4{1}	13143	4022		8.08	(16) OCC	42.46	141.48

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 Operating Condition with Expansion Joint  
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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A06 F-	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	13210			8.08	(15) SUST	34.19	117.90
	TR:Amb to T1{1}			1848	8.08	(17) DISP	5.15	176.85
	Amb to T1{1}			1848	8.08	(17) DISP	5.15	176.85
	Sus. + E1{1}	13210	4867		8.08	(16) OCC	44.36	141.48
	Sus. + E2{1}	13210	4867		8.08	(16) OCC	44.36	141.48
	Sus. + E3{1}	13210	3986		8.08	(16) OCC	42.52	141.48
	Sus. + E4{1}	13210	3986		8.08	(16) OCC	42.52	141.48
	Sus. + W1{1}	13210	5058		8.08	(16) OCC	44.76	141.48
	Sus. + W2{1}	13210	5058		8.08	(16) OCC	44.76	141.48
	Sus. + W3{1}	13210	4105		8.08	(16) OCC	42.77	141.48
	Sus. + W4{1}	13210	4105		8.08	(16) OCC	42.77	141.48
A09 F-	Max P{1}					( 3) HOOP	18.78	117.90

GR + Max P{1}	24482		4.30	(15)	SUST	33.78	117.90
TR:Amb to T1{1}			1224	4.30	(17)	DISP	1.81 176.85
Amb to T1{1}			1224	4.30	(17)	DISP	1.81 176.85
Sus. + E1{1}	24482	1727	4.30	(16)	OCC	35.70	141.48
Sus. + E2{1}	24482	1727	4.30	(16)	OCC	35.70	141.48
Sus. + E3{1}	24482	2177	4.30	(16)	OCC	36.20	141.48
Sus. + E4{1}	24482	2177	4.30	(16)	OCC	36.20	141.48
Sus. + W1{1}	24482	2409	4.30	(16)	OCC	36.46	141.48
Sus. + W2{1}	24482	2409	4.30	(16)	OCC	36.46	141.48
Sus. + W3{1}	24482	1781	4.30	(16)	OCC	35.76	141.48
Sus. + W4{1}	24482	1781	4.30	(16)	OCC	35.76	141.48
A10 + Max P{1}							
GR + Max P{1}	65264			( 3)	HOOP	18.78	117.90
TR:Amb to T1{1}			1258	1.00	(15)	SUST	29.08 117.90
Amb to T1{1}			1258	1.00	(17)	DISP	0.43 176.85
Sus. + E1{1}	65264	2089	1.00	(16)	OCC	29.80	141.48
Sus. + E2{1}	65264	2089	1.00	(16)	OCC	29.80	141.48
Sus. + E3{1}	65264	1647	1.00	(16)	OCC	29.65	141.48
Sus. + E4{1}	65264	1647	1.00	(16)	OCC	29.65	141.48
Sus. + W1{1}	65264	2231	1.00	(16)	OCC	29.85	141.48
Sus. + W2{1}	65264	2231	1.00	(16)	OCC	29.85	141.48
Sus. + W3{1}	65264	1415	1.00	(16)	OCC	29.57	141.48
Sus. + W4{1}	65264	1415	1.00	(16)	OCC	29.57	141.48
A10 - Max P{1}							
GR + Max P{1}	65264			( 3)	HOOP	18.78	117.90
TR:Amb to T1{1}			1258	1.00	(15)	SUST	29.08 117.90
Amb to T1{1}			1258	1.00	(17)	DISP	0.43 176.85
Sus. + E1{1}	65264	2089	1.00	(16)	OCC	29.80	141.48
Sus. + E2{1}	65264	2089	1.00	(16)	OCC	29.80	141.48
Sus. + E3{1}	65264	1647	1.00	(16)	OCC	29.65	141.48
Sus. + E4{1}	65264	1647	1.00	(16)	OCC	29.65	141.48
Sus. + W1{1}	65264	2231	1.00	(16)	OCC	29.85	141.48
Sus. + W2{1}	65264	2231	1.00	(16)	OCC	29.85	141.48
Sus. + W3{1}	65264	1415	1.00	(16)	OCC	29.57	141.48
Sus. + W4{1}	65264	1415	1.00	(16)	OCC	29.57	141.48

Operating Condition with Expansion Joint  
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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F			
A02 F-	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	11060			4.30	(15)	SUST	18.86	117.90
	TR:Amb to T1{1}			2199	4.30	(17)	DISP	3.26	176.85
	Amb to T1{1}			2199	4.30	(17)	DISP	3.26	176.85
	Sus. + E1{1}	11060	8761		4.30	(16)	OCC	28.60	141.48
	Sus. + E2{1}	11060	8761		4.30	(16)	OCC	28.60	141.48
	Sus. + E3{1}	11060	6428		4.30	(16)	OCC	26.00	141.48
	Sus. + E4{1}	11060	6428		4.30	(16)	OCC	26.00	141.48
	Sus. + W1{1}	11060	7404		4.30	(16)	OCC	27.09	141.48
	Sus. + W2{1}	11060	7404		4.30	(16)	OCC	27.09	141.48
	Sus. + W3{1}	11060	5165		4.30	(16)	OCC	24.60	141.48
	Sus. + W4{1}	11060	5165		4.30	(16)	OCC	24.60	141.48
A11 F-	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	11433			4.30	(15)	SUST	19.27	117.90
	TR:Amb to T1{1}			898	4.30	(17)	DISP	1.33	176.85
	Amb to T1{1}			898	4.30	(17)	DISP	1.33	176.85
	Sus. + E1{1}	11433	2700		4.30	(16)	OCC	22.27	141.48
	Sus. + E2{1}	11433	2700		4.30	(16)	OCC	22.27	141.48
	Sus. + E3{1}	11433	2909		4.30	(16)	OCC	22.51	141.48
	Sus. + E4{1}	11433	2909		4.30	(16)	OCC	22.51	141.48
	Sus. + W1{1}	11433	5830		4.30	(16)	OCC	25.75	141.48
	Sus. + W2{1}	11433	5830		4.30	(16)	OCC	25.75	141.48
	Sus. + W3{1}	11433	3617		4.30	(16)	OCC	23.29	141.48
	Sus. + W4{1}	11433	3617		4.30	(16)	OCC	23.29	141.48
A14 F-	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	5274			4.30	(15)	SUST	12.42	117.90
	TR:Amb to T1{1}			239	4.30	(17)	DISP	0.35	176.85
	Amb to T1{1}			239	4.30	(17)	DISP	0.35	176.85
	Sus. + E1{1}	5274	6064		4.30	(16)	OCC	19.16	141.48

Sus. + E2{1}	5274	6064	4.30	(16)	OCC	19.16	141.48
Sus. + E3{1}	5274	2933	4.30	(16)	OCC	15.68	141.48
Sus. + E4{1}	5274	2933	4.30	(16)	OCC	15.68	141.48
Sus. + W1{1}	5274	10312	4.30	(16)	OCC	23.89	141.48
Sus. + W2{1}	5274	10312	4.30	(16)	OCC	23.89	141.48
Sus. + W3{1}	5274	4944	4.30	(16)	OCC	17.92	141.48
Sus. + W4{1}	5274	4944	4.30	(16)	OCC	17.92	141.48

A09 N+ Max P{1}				( 3)	HOOP	18.78	117.90
GR + Max P{1}	12779			4.30	(15) SUST	20.77	117.90
TR:Amb to T1{1}			1305	4.30	(17) DISP	1.93	176.85
Amb to T1{1}			1305	4.30	(17) DISP	1.93	176.85
Sus. + E1{1}	12779	2257		4.30	(16) OCC	23.28	141.48
Sus. + E2{1}	12779	2257		4.30	(16) OCC	23.28	141.48
Sus. + E3{1}	12779	2475		4.30	(16) OCC	23.52	141.48
Sus. + E4{1}	12779	2475		4.30	(16) OCC	23.52	141.48
Sus. + W1{1}	12779	1967		4.30	(16) OCC	22.95	141.48
Sus. + W2{1}	12779	1967		4.30	(16) OCC	22.95	141.48
Sus. + W3{1}	12779	2231		4.30	(16) OCC	23.25	141.48
Sus. + W4{1}	12779	2231		4.30	(16) OCC	23.25	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			Eq. no.	Load type	Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )					
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A05 F- Max P{1}					( 3)	HOOP	18.78	117.90
GR + Max P{1}		7510			4.30	(15) SUST	14.91	117.90
TR:Amb to T1{1}				2813	4.30	(17) DISP	4.17	176.85
Amb to T1{1}				2813	4.30	(17) DISP	4.17	176.85
Sus. + E1{1}		7510	6008		4.30	(16) OCC	21.59	141.48
Sus. + E2{1}		7510	6008		4.30	(16) OCC	21.59	141.48
Sus. + E3{1}		7510	2703		4.30	(16) OCC	17.91	141.48
Sus. + E4{1}		7510	2703		4.30	(16) OCC	17.91	141.48
Sus. + W1{1}		7510	6053		4.30	(16) OCC	21.64	141.48
Sus. + W2{1}		7510	6053		4.30	(16) OCC	21.64	141.48
Sus. + W3{1}		7510	1960		4.30	(16) OCC	17.09	141.48
Sus. + W4{1}		7510	1960		4.30	(16) OCC	17.09	141.48
A04 N+ Max P{1}					( 3)	HOOP	18.78	117.90
GR + Max P{1}		7193			4.30	(15) SUST	14.56	117.90
TR:Amb to T1{1}				2925	4.30	(17) DISP	4.34	176.85
Amb to T1{1}				2925	4.30	(17) DISP	4.34	176.85
Sus. + E1{1}		7193	6148		4.30	(16) OCC	21.39	141.48
Sus. + E2{1}		7193	6148		4.30	(16) OCC	21.39	141.48
Sus. + E3{1}		7193	3219		4.30	(16) OCC	18.14	141.48
Sus. + E4{1}		7193	3219		4.30	(16) OCC	18.14	141.48
Sus. + W1{1}		7193	6254		4.30	(16) OCC	21.51	141.48
Sus. + W2{1}		7193	6254		4.30	(16) OCC	21.51	141.48
Sus. + W3{1}		7193	2592		4.30	(16) OCC	17.44	141.48
Sus. + W4{1}		7193	2592		4.30	(16) OCC	17.44	141.48
A08 + Max P{1}					( 3)	HOOP	18.78	117.90
GR + Max P{1}		10989			1.00	(15) SUST	10.35	117.90
TR:Amb to T1{1}				1894	1.00	(17) DISP	0.65	176.85
Amb to T1{1}				1894	1.00	(17) DISP	0.65	176.85
Sus. + E1{1}		10989	20859		1.00	(16) OCC	17.55	141.48
Sus. + E2{1}		10989	20859		1.00	(16) OCC	17.55	141.48
Sus. + E3{1}		10989	15228		1.00	(16) OCC	15.61	141.48
Sus. + E4{1}		10989	15228		1.00	(16) OCC	15.61	141.48
Sus. + W1{1}		10989	31388		1.00	(16) OCC	21.18	141.48
Sus. + W2{1}		10989	31388		1.00	(16) OCC	21.18	141.48
Sus. + W3{1}		10989	16907		1.00	(16) OCC	16.19	141.48
Sus. + W4{1}		10989	16907		1.00	(16) OCC	16.19	141.48
A08 - Max P{1}					( 3)	HOOP	18.78	117.90
GR + Max P{1}		10989			1.00	(15) SUST	10.35	117.90
TR:Amb to T1{1}				1894	1.00	(17) DISP	0.65	176.85
Amb to T1{1}				1894	1.00	(17) DISP	0.65	176.85
Sus. + E1{1}		10989	20859		1.00	(16) OCC	17.55	141.48
Sus. + E2{1}		10989	20859		1.00	(16) OCC	17.55	141.48
Sus. + E3{1}		10989	15228		1.00	(16) OCC	15.61	141.48
Sus. + E4{1}		10989	15228		1.00	(16) OCC	15.61	141.48
Sus. + W1{1}		10989	31388		1.00	(16) OCC	21.18	141.48

Sus. + W2{1}	10989	31388	1.00	(16)	OCC	21.18	141.48
Sus. + W3{1}	10989	16907	1.00	(16)	OCC	16.19	141.48
Sus. + W4{1}	10989	16907	1.00	(16)	OCC	16.19	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )	Ma (Sus.)	Mb (Occ.)			
A05 N+	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	7606			4.30	(15) SUST	15.02	117.90
	TR:Amb to Tl{1}			2827	4.30	(17) DISP	4.19	176.85
	Amb to Tl{1}			2827	4.30	(17) DISP	4.19	176.85
	Sus. + E1{1}	7606	4821		4.30	(16) OCC	20.38	141.48
	Sus. + E2{1}	7606	4821		4.30	(16) OCC	20.38	141.48
	Sus. + E3{1}	7606	3177		4.30	(16) OCC	18.55	141.48
	Sus. + E4{1}	7606	3177		4.30	(16) OCC	18.55	141.48
	Sus. + W1{1}	7606	4533		4.30	(16) OCC	20.06	141.48
	Sus. + W2{1}	7606	4533		4.30	(16) OCC	20.06	141.48
	Sus. + W3{1}	7606	2811		4.30	(16) OCC	18.14	141.48
	Sus. + W4{1}	7606	2811		4.30	(16) OCC	18.14	141.48
A13 F-	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	5484			4.30	(15) SUST	12.66	117.90
	TR:Amb to Tl{1}			441	4.30	(17) DISP	0.65	176.85
	Amb to Tl{1}			441	4.30	(17) DISP	0.65	176.85
	Sus. + E1{1}	5484	3023		4.30	(16) OCC	16.02	141.48
	Sus. + E2{1}	5484	3023		4.30	(16) OCC	16.02	141.48
	Sus. + E3{1}	5484	1369		4.30	(16) OCC	14.18	141.48
	Sus. + E4{1}	5484	1369		4.30	(16) OCC	14.18	141.48
	Sus. + W1{1}	5484	5748		4.30	(16) OCC	19.05	141.48
	Sus. + W2{1}	5484	5748		4.30	(16) OCC	19.05	141.48
	Sus. + W3{1}	5484	2225		4.30	(16) OCC	15.13	141.48
	Sus. + W4{1}	5484	2225		4.30	(16) OCC	15.13	141.48
A13 N+	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	3199			4.30	(15) SUST	10.12	117.90
	TR:Amb to Tl{1}			525	4.30	(17) DISP	0.78	176.85
	Amb to Tl{1}			525	4.30	(17) DISP	0.78	176.85
	Sus. + E1{1}	3199	3803		4.30	(16) OCC	14.34	141.48
	Sus. + E2{1}	3199	3803		4.30	(16) OCC	14.34	141.48
	Sus. + E3{1}	3199	1845		4.30	(16) OCC	12.17	141.48
	Sus. + E4{1}	3199	1845		4.30	(16) OCC	12.17	141.48
	Sus. + W1{1}	3199	8021		4.30	(16) OCC	19.03	141.48
	Sus. + W2{1}	3199	8021		4.30	(16) OCC	19.03	141.48
	Sus. + W3{1}	3199	3297		4.30	(16) OCC	13.78	141.48
	Sus. + W4{1}	3199	3297		4.30	(16) OCC	13.78	141.48
A04 F-	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	6993			4.30	(15) SUST	14.33	117.90
	TR:Amb to Tl{1}			2341	4.30	(17) DISP	3.47	176.85
	Amb to Tl{1}			2341	4.30	(17) DISP	3.47	176.85
	Sus. + E1{1}	6993	3908		4.30	(16) OCC	18.68	141.48
	Sus. + E2{1}	6993	3908		4.30	(16) OCC	18.68	141.48
	Sus. + E3{1}	6993	4087		4.30	(16) OCC	18.88	141.48
	Sus. + E4{1}	6993	4087		4.30	(16) OCC	18.88	141.48
	Sus. + W1{1}	6993	3593		4.30	(16) OCC	18.33	141.48
	Sus. + W2{1}	6993	3593		4.30	(16) OCC	18.33	141.48
	Sus. + W3{1}	6993	3405		4.30	(16) OCC	18.12	141.48
	Sus. + W4{1}	6993	3405		4.30	(16) OCC	18.12	141.48

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Point	Load	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load	Code	Code
		(Moments in N.m )	(Stress in N/mm2 )	Ma	Mb			

name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no.	type	Stress	Allow.
A15	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	3308			1.00	(15)	SUST	7.70	117.90
	TR:Amb to T1{1}			496	1.00	(17)	DISP	0.17	176.85
	Amb to T1{1}			496	1.00	(17)	DISP	0.17	176.85
	Sus. + E1{1}	3308	11519		1.00	(16)	OCC	11.68	141.48
	Sus. + E2{1}	3308	11519		1.00	(16)	OCC	11.68	141.48
	Sus. + E3{1}	3308	12096		1.00	(16)	OCC	11.87	141.48
	Sus. + E4{1}	3308	12096		1.00	(16)	OCC	11.87	141.48
	Sus. + W1{1}	3308	23300		1.00	(16)	OCC	15.74	141.48
	Sus. + W2{1}	3308	23300		1.00	(16)	OCC	15.74	141.48
	Sus. + W3{1}	3308	18822		1.00	(16)	OCC	14.20	141.48
	Sus. + W4{1}	3308	18822		1.00	(16)	OCC	14.20	141.48
A14 F+	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	5274			1.00	(15)	SUST	8.38	117.90
	TR:Amb to T1{1}			239	1.00	(17)	DISP	0.08	176.85
	Amb to T1{1}			239	1.00	(17)	DISP	0.08	176.85
	Sus. + E1{1}	5274	6064		1.00	(16)	OCC	10.47	141.48
	Sus. + E2{1}	5274	6064		1.00	(16)	OCC	10.47	141.48
	Sus. + E3{1}	5274	2933		1.00	(16)	OCC	9.39	141.48
	Sus. + E4{1}	5274	2933		1.00	(16)	OCC	9.39	141.48
	Sus. + W1{1}	5274	10312		1.00	(16)	OCC	11.94	141.48
	Sus. + W2{1}	5274	10312		1.00	(16)	OCC	11.94	141.48
	Sus. + W3{1}	5274	4944		1.00	(16)	OCC	10.09	141.48
	Sus. + W4{1}	5274	4944		1.00	(16)	OCC	10.09	141.48
A14 N+	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	2002			4.30	(15)	SUST	8.79	117.90
	TR:Amb to T1{1}			186	4.30	(17)	DISP	0.28	176.85
	Amb to T1{1}			186	4.30	(17)	DISP	0.28	176.85
	Sus. + E1{1}	2002	4793		4.30	(16)	OCC	14.11	141.48
	Sus. + E2{1}	2002	4793		4.30	(16)	OCC	14.11	141.48
	Sus. + E3{1}	2002	2245		4.30	(16)	OCC	11.28	141.48
	Sus. + E4{1}	2002	2245		4.30	(16)	OCC	11.28	141.48
	Sus. + W1{1}	2002	7319		4.30	(16)	OCC	16.92	141.48
	Sus. + W2{1}	2002	7319		4.30	(16)	OCC	16.92	141.48
	Sus. + W3{1}	2002	4009		4.30	(16)	OCC	13.24	141.48
	Sus. + W4{1}	2002	4009		4.30	(16)	OCC	13.24	141.48
A14 N-	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	2002			1.00	(15)	SUST	7.25	117.90
	TR:Amb to T1{1}			186	1.00	(17)	DISP	0.06	176.85
	Amb to T1{1}			186	1.00	(17)	DISP	0.06	176.85
	Sus. + E1{1}	2002	4793		1.00	(16)	OCC	8.90	141.48
	Sus. + E2{1}	2002	4793		1.00	(16)	OCC	8.90	141.48
	Sus. + E3{1}	2002	2245		1.00	(16)	OCC	8.03	141.48
	Sus. + E4{1}	2002	2245		1.00	(16)	OCC	8.03	141.48
	Sus. + W1{1}	2002	7319		1.00	(16)	OCC	9.78	141.48
	Sus. + W2{1}	2002	7319		1.00	(16)	OCC	9.78	141.48
	Sus. + W3{1}	2002	4009		1.00	(16)	OCC	8.63	141.48
	Sus. + W4{1}	2002	4009		1.00	(16)	OCC	8.63	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. no.	Load type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )						
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)					
A13 F+	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	5484			1.00	(15)	SUST	8.45	117.90
	TR:Amb to T1{1}			441	1.00	(17)	DISP	0.15	176.85
	Amb to T1{1}			441	1.00	(17)	DISP	0.15	176.85
	Sus. + E1{1}	5484	3023		1.00	(16)	OCC	9.50	141.48
	Sus. + E2{1}	5484	3023		1.00	(16)	OCC	9.50	141.48
	Sus. + E3{1}	5484	1369		1.00	(16)	OCC	8.92	141.48
	Sus. + E4{1}	5484	1369		1.00	(16)	OCC	8.92	141.48
	Sus. + W1{1}	5484	5748		1.00	(16)	OCC	10.44	141.48
	Sus. + W2{1}	5484	5748		1.00	(16)	OCC	10.44	141.48
	Sus. + W3{1}	5484	2225		1.00	(16)	OCC	9.22	141.48
	Sus. + W4{1}	5484	2225		1.00	(16)	OCC	9.22	141.48
A13 N-	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	3199			1.00	(15)	SUST	7.66	117.90

TR:Amb to T1{1}			525	1.00	(17)	DISP	0.18	176.85
Amb to T1{1}			525	1.00	(17)	DISP	0.18	176.85
Sus. + E1{1}	3199	3803		1.00	(16)	OCC	8.98	141.48
Sus. + E2{1}	3199	3803		1.00	(16)	OCC	8.98	141.48
Sus. + E3{1}	3199	1845		1.00	(16)	OCC	8.30	141.48
Sus. + E4{1}	3199	1845		1.00	(16)	OCC	8.30	141.48
Sus. + W1{1}	3199	8021		1.00	(16)	OCC	10.43	141.48
Sus. + W2{1}	3199	8021		1.00	(16)	OCC	10.43	141.48
Sus. + W3{1}	3199	3297		1.00	(16)	OCC	8.80	141.48
Sus. + W4{1}	3199	3297		1.00	(16)	OCC	8.80	141.48
A12 + Max P{1}								
GR + Max P{1}	11747			1.00	(15)	SUST	10.61	117.90
TR:Amb to T1{1}			908	1.00	(17)	DISP	0.31	176.85
Amb to T1{1}			908	1.00	(17)	DISP	0.31	176.85
Sus. + E1{1}	11747	2880		1.00	(16)	OCC	11.61	141.48
Sus. + E2{1}	11747	2880		1.00	(16)	OCC	11.61	141.48
Sus. + E3{1}	11747	3134		1.00	(16)	OCC	11.69	141.48
Sus. + E4{1}	11747	3134		1.00	(16)	OCC	11.69	141.48
Sus. + W1{1}	11747	6028		1.00	(16)	OCC	12.69	141.48
Sus. + W2{1}	11747	6028		1.00	(16)	OCC	12.69	141.48
Sus. + W3{1}	11747	3801		1.00	(16)	OCC	11.92	141.48
Sus. + W4{1}	11747	3801		1.00	(16)	OCC	11.92	141.48
A12 - Max P{1}								
GR + Max P{1}	11747			1.00	(15)	SUST	10.61	117.90
TR:Amb to T1{1}			908	1.00	(17)	DISP	0.31	176.85
Amb to T1{1}			908	1.00	(17)	DISP	0.31	176.85
Sus. + E1{1}	11747	2880		1.00	(16)	OCC	11.61	141.48
Sus. + E2{1}	11747	2880		1.00	(16)	OCC	11.61	141.48
Sus. + E3{1}	11747	3134		1.00	(16)	OCC	11.69	141.48
Sus. + E4{1}	11747	3134		1.00	(16)	OCC	11.69	141.48
Sus. + W1{1}	11747	6028		1.00	(16)	OCC	12.69	141.48
Sus. + W2{1}	11747	6028		1.00	(16)	OCC	12.69	141.48
Sus. + W3{1}	11747	3801		1.00	(16)	OCC	11.92	141.48
Sus. + W4{1}	11747	3801		1.00	(16)	OCC	11.92	141.48

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ASME B31.1 (2014) CODE COMPLIANCE								
(Moments in N.m )			(Stress in N/mm2 )					
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.
-----								
All F+	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	11433			1.00	(15) SUST	10.51	117.90
	TR:Amb to T1{1}			898	1.00	(17) DISP	0.31	176.85
	Amb to T1{1}			898	1.00	(17) DISP	0.31	176.85
	Sus. + E1{1}	11433	2700		1.00	(16) OCC	11.44	141.48
	Sus. + E2{1}	11433	2700		1.00	(16) OCC	11.44	141.48
	Sus. + E3{1}	11433	2909		1.00	(16) OCC	11.51	141.48
	Sus. + E4{1}	11433	2909		1.00	(16) OCC	11.51	141.48
	Sus. + W1{1}	11433	5830		1.00	(16) OCC	12.52	141.48
	Sus. + W2{1}	11433	5830		1.00	(16) OCC	12.52	141.48
	Sus. + W3{1}	11433	3617		1.00	(16) OCC	11.75	141.48
	Sus. + W4{1}	11433	3617		1.00	(16) OCC	11.75	141.48
-----								
All N+	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	7811			4.30	(15) SUST	15.24	117.90
	TR:Amb to T1{1}			939	4.30	(17) DISP	1.39	176.85
	Amb to T1{1}			939	4.30	(17) DISP	1.39	176.85
	Sus. + E1{1}	7811	1133		4.30	(16) OCC	16.50	141.48
	Sus. + E2{1}	7811	1133		4.30	(16) OCC	16.50	141.48
	Sus. + E3{1}	7811	958		4.30	(16) OCC	16.31	141.48
	Sus. + E4{1}	7811	958		4.30	(16) OCC	16.31	141.48
	Sus. + W1{1}	7811	2407		4.30	(16) OCC	17.92	141.48
	Sus. + W2{1}	7811	2407		4.30	(16) OCC	17.92	141.48
	Sus. + W3{1}	7811	1704		4.30	(16) OCC	17.14	141.48
	Sus. + W4{1}	7811	1704		4.30	(16) OCC	17.14	141.48
-----								
All N-	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	7811			1.00	(15) SUST	9.26	117.90
	TR:Amb to T1{1}			939	1.00	(17) DISP	0.32	176.85
	Amb to T1{1}			939	1.00	(17) DISP	0.32	176.85
	Sus. + E1{1}	7811	1133		1.00	(16) OCC	9.65	141.48
	Sus. + E2{1}	7811	1133		1.00	(16) OCC	9.65	141.48

Sus. + E3{1}	7811	958	1.00	(16)	OCC	9.59	141.48
Sus. + E4{1}	7811	958	1.00	(16)	OCC	9.59	141.48
Sus. + W1{1}	7811	2407	1.00	(16)	OCC	10.09	141.48
Sus. + W2{1}	7811	2407	1.00	(16)	OCC	10.09	141.48
Sus. + W3{1}	7811	1704	1.00	(16)	OCC	9.84	141.48
Sus. + W4{1}	7811	1704	1.00	(16)	OCC	9.84	141.48

A09 F+ Max P{1}				( 3)	HOOP	18.78	117.90
GR + Max P{1}	24482		1.00	(15)	SUST	15.01	117.90
TR:Amb to T1{1}			1224	1.00	(17)	DISP	0.42 176.85
Amb to T1{1}			1224	1.00	(17)	DISP	0.42 176.85
Sus. + E1{1}	24482	1727	1.00	(16)	OCC	15.60	141.48
Sus. + E2{1}	24482	1727	1.00	(16)	OCC	15.60	141.48
Sus. + E3{1}	24482	2177	1.00	(16)	OCC	15.76	141.48
Sus. + E4{1}	24482	2177	1.00	(16)	OCC	15.76	141.48
Sus. + W1{1}	24482	2409	1.00	(16)	OCC	15.84	141.48
Sus. + W2{1}	24482	2409	1.00	(16)	OCC	15.84	141.48
Sus. + W3{1}	24482	1781	1.00	(16)	OCC	15.62	141.48
Sus. + W4{1}	24482	1781	1.00	(16)	OCC	15.62	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )						
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F			
A09 N- Max P{1}						( 3) HOOP	18.78	117.90
GR + Max P{1}		12779			1.00	(15) SUST	10.97	117.90
TR:Amb to T1{1}				1305	1.00	(17) DISP	0.45	176.85
Amb to T1{1}				1305	1.00	(17) DISP	0.45	176.85
Sus. + E1{1}		12779	2257		1.00	(16) OCC	11.75	141.48
Sus. + E2{1}		12779	2257		1.00	(16) OCC	11.75	141.48
Sus. + E3{1}		12779	2475		1.00	(16) OCC	11.82	141.48
Sus. + E4{1}		12779	2475		1.00	(16) OCC	11.82	141.48
Sus. + W1{1}		12779	1967		1.00	(16) OCC	11.65	141.48
Sus. + W2{1}		12779	1967		1.00	(16) OCC	11.65	141.48
Sus. + W3{1}		12779	2231		1.00	(16) OCC	11.74	141.48
Sus. + W4{1}		12779	2231		1.00	(16) OCC	11.74	141.48
A07 F+ Max P{1}						( 3) HOOP	18.78	117.90
GR + Max P{1}		16469			1.00	(15) SUST	12.24	117.90
TR:Amb to T1{1}				1964	1.00	(17) DISP	0.68	176.85
Amb to T1{1}				1964	1.00	(17) DISP	0.68	176.85
Sus. + E1{1}		16469	1302		1.00	(16) OCC	12.69	141.48
Sus. + E2{1}		16469	1302		1.00	(16) OCC	12.69	141.48
Sus. + E3{1}		16469	3479		1.00	(16) OCC	13.44	141.48
Sus. + E4{1}		16469	3479		1.00	(16) OCC	13.44	141.48
Sus. + W1{1}		16469	3182		1.00	(16) OCC	13.34	141.48
Sus. + W2{1}		16469	3182		1.00	(16) OCC	13.34	141.48
Sus. + W3{1}		16469	3041		1.00	(16) OCC	13.29	141.48
Sus. + W4{1}		16469	3041		1.00	(16) OCC	13.29	141.48
A07 N- Max P{1}						( 3) HOOP	18.78	117.90
GR + Max P{1}		15782			1.00	(15) SUST	12.01	117.90
TR:Amb to T1{1}				2006	1.00	(17) DISP	0.69	176.85
Amb to T1{1}				2006	1.00	(17) DISP	0.69	176.85
Sus. + E1{1}		15782	1543		1.00	(16) OCC	12.54	141.48
Sus. + E2{1}		15782	1543		1.00	(16) OCC	12.54	141.48
Sus. + E3{1}		15782	3611		1.00	(16) OCC	13.25	141.48
Sus. + E4{1}		15782	3611		1.00	(16) OCC	13.25	141.48
Sus. + W1{1}		15782	2294		1.00	(16) OCC	12.80	141.48
Sus. + W2{1}		15782	2294		1.00	(16) OCC	12.80	141.48
Sus. + W3{1}		15782	3248		1.00	(16) OCC	13.13	141.48
Sus. + W4{1}		15782	3248		1.00	(16) OCC	13.13	141.48
A06 F+ Max P{1}						( 3) HOOP	18.78	117.90
GR + Max P{1}		13210			1.00	(15) SUST	11.12	117.90
TR:Amb to T1{1}				1848	1.00	(17) DISP	0.64	176.85
Amb to T1{1}				1848	1.00	(17) DISP	0.64	176.85
Sus. + E1{1}		13210	4867		1.00	(16) OCC	12.80	141.48
Sus. + E2{1}		13210	4867		1.00	(16) OCC	12.80	141.48
Sus. + E3{1}		13210	3986		1.00	(16) OCC	12.49	141.48
Sus. + E4{1}		13210	3986		1.00	(16) OCC	12.49	141.48
Sus. + W1{1}		13210	5058		1.00	(16) OCC	12.86	141.48
Sus. + W2{1}		13210	5058		1.00	(16) OCC	12.86	141.48



Sus. + W3{1}	13210	4105	1.00	(16)	OCC	12.53	141.48
Sus. + W4{1}	13210	4105	1.00	(16)	OCC	12.53	141.48

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		ASME B31.1 (2014)		CODE COMPLIANCE			
		(Moments in N.m )		(Stress in N/mm2 )			
Point	Load	Ma	Mb	Mc	Eq. Load	Code	Code
name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no. type	Stress Allow.
A06 N-	Max P{1}					( 3) HOOP	18.78 117.90
	GR + Max P{1}	13143			1.00	(15) SUST	11.09 117.90
	TR:Amb to T1{1}			1887	1.00	(17) DISP	0.65 176.85
	Amb to T1{1}			1887	1.00	(17) DISP	0.65 176.85
	Sus. + E1{1}	13143	4997		1.00	(16) OCC	12.82 141.48
	Sus. + E2{1}	13143	4997		1.00	(16) OCC	12.82 141.48
	Sus. + E3{1}	13143	3920		1.00	(16) OCC	12.45 141.48
	Sus. + E4{1}	13143	3920		1.00	(16) OCC	12.45 141.48
	Sus. + W1{1}	13143	5248		1.00	(16) OCC	12.91 141.48
	Sus. + W2{1}	13143	5248		1.00	(16) OCC	12.91 141.48
	Sus. + W3{1}	13143	4022		1.00	(16) OCC	12.48 141.48
	Sus. + W4{1}	13143	4022		1.00	(16) OCC	12.48 141.48
A05 F+	Max P{1}					( 3) HOOP	18.78 117.90
	GR + Max P{1}	7510			1.00	(15) SUST	9.15 117.90
	TR:Amb to T1{1}			2813	1.00	(17) DISP	0.97 176.85
	Amb to T1{1}			2813	1.00	(17) DISP	0.97 176.85
	Sus. + E1{1}	7510	6008		1.00	(16) OCC	11.22 141.48
	Sus. + E2{1}	7510	6008		1.00	(16) OCC	11.22 141.48
	Sus. + E3{1}	7510	2703		1.00	(16) OCC	10.08 141.48
	Sus. + E4{1}	7510	2703		1.00	(16) OCC	10.08 141.48
	Sus. + W1{1}	7510	6053		1.00	(16) OCC	11.24 141.48
	Sus. + W2{1}	7510	6053		1.00	(16) OCC	11.24 141.48
	Sus. + W3{1}	7510	1960		1.00	(16) OCC	9.83 141.48
	Sus. + W4{1}	7510	1960		1.00	(16) OCC	9.83 141.48
A05 N-	Max P{1}					( 3) HOOP	18.78 117.90
	GR + Max P{1}	7606			1.00	(15) SUST	9.18 117.90
	TR:Amb to T1{1}			2827	1.00	(17) DISP	0.98 176.85
	Amb to T1{1}			2827	1.00	(17) DISP	0.98 176.85
	Sus. + E1{1}	7606	4821		1.00	(16) OCC	10.85 141.48
	Sus. + E2{1}	7606	4821		1.00	(16) OCC	10.85 141.48
	Sus. + E3{1}	7606	3177		1.00	(16) OCC	10.28 141.48
	Sus. + E4{1}	7606	3177		1.00	(16) OCC	10.28 141.48
	Sus. + W1{1}	7606	4533		1.00	(16) OCC	10.75 141.48
	Sus. + W2{1}	7606	4533		1.00	(16) OCC	10.75 141.48
	Sus. + W3{1}	7606	2811		1.00	(16) OCC	10.15 141.48
	Sus. + W4{1}	7606	2811		1.00	(16) OCC	10.15 141.48
A04 F+	Max P{1}					( 3) HOOP	18.78 117.90
	GR + Max P{1}	6993			1.00	(15) SUST	8.97 117.90
	TR:Amb to T1{1}			2341	1.00	(17) DISP	0.81 176.85
	Amb to T1{1}			2341	1.00	(17) DISP	0.81 176.85
	Sus. + E1{1}	6993	3908		1.00	(16) OCC	10.32 141.48
	Sus. + E2{1}	6993	3908		1.00	(16) OCC	10.32 141.48
	Sus. + E3{1}	6993	4087		1.00	(16) OCC	10.38 141.48
	Sus. + E4{1}	6993	4087		1.00	(16) OCC	10.38 141.48
	Sus. + W1{1}	6993	3593		1.00	(16) OCC	10.21 141.48
	Sus. + W2{1}	6993	3593		1.00	(16) OCC	10.21 141.48
	Sus. + W3{1}	6993	3405		1.00	(16) OCC	10.15 141.48
	Sus. + W4{1}	6993	3405		1.00	(16) OCC	10.15 141.48

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		ASME B31.1 (2014)		CODE COMPLIANCE			
		(Moments in N.m )		(Stress in N/mm2 )			
Point	Load	Ma	Mb	Mc	Eq. Load	Code	Code
name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no. type	Stress Allow.

-----									
A04 N-	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	7193			1.00	(15)	SUST	9.04	117.90
	TR:Amb to T1{1}			2925	1.00	(17)	DISP	1.01	176.85
	Amb to T1{1}			2925	1.00	(17)	DISP	1.01	176.85
	Sus. + E1{1}	7193	6148		1.00	(16)	OCC	11.16	141.48
	Sus. + E2{1}	7193	6148		1.00	(16)	OCC	11.16	141.48
	Sus. + E3{1}	7193	3219		1.00	(16)	OCC	10.15	141.48
	Sus. + E4{1}	7193	3219		1.00	(16)	OCC	10.15	141.48
	Sus. + W1{1}	7193	6254		1.00	(16)	OCC	11.20	141.48
	Sus. + W2{1}	7193	6254		1.00	(16)	OCC	11.20	141.48
	Sus. + W3{1}	7193	2592		1.00	(16)	OCC	9.94	141.48
	Sus. + W4{1}	7193	2592		1.00	(16)	OCC	9.94	141.48
A03 +	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	19249			1.00	(15)	SUST	13.20	117.90
	TR:Amb to T1{1}			4297	1.00	(17)	DISP	1.48	176.85
	Amb to T1{1}			4297	1.00	(17)	DISP	1.48	176.85
	Sus. + E1{1}	19249	8293		1.00	(16)	OCC	16.06	141.48
	Sus. + E2{1}	19249	8293		1.00	(16)	OCC	16.06	141.48
	Sus. + E3{1}	19249	9650		1.00	(16)	OCC	16.53	141.48
	Sus. + E4{1}	19249	9650		1.00	(16)	OCC	16.53	141.48
	Sus. + W1{1}	19249	7420		1.00	(16)	OCC	15.76	141.48
	Sus. + W2{1}	19249	7420		1.00	(16)	OCC	15.76	141.48
	Sus. + W3{1}	19249	8405		1.00	(16)	OCC	16.10	141.48
	Sus. + W4{1}	19249	8405		1.00	(16)	OCC	16.10	141.48
A03 -	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	19249			1.00	(15)	SUST	13.20	117.90
	TR:Amb to T1{1}			4297	1.00	(17)	DISP	1.48	176.85
	Amb to T1{1}			4297	1.00	(17)	DISP	1.48	176.85
	Sus. + E1{1}	19249	8293		1.00	(16)	OCC	16.06	141.48
	Sus. + E2{1}	19249	8293		1.00	(16)	OCC	16.06	141.48
	Sus. + E3{1}	19249	9650		1.00	(16)	OCC	16.53	141.48
	Sus. + E4{1}	19249	9650		1.00	(16)	OCC	16.53	141.48
	Sus. + W1{1}	19249	7420		1.00	(16)	OCC	15.76	141.48
	Sus. + W2{1}	19249	7420		1.00	(16)	OCC	15.76	141.48
	Sus. + W3{1}	19249	8405		1.00	(16)	OCC	16.10	141.48
	Sus. + W4{1}	19249	8405		1.00	(16)	OCC	16.10	141.48
A02 F+	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	11060			1.00	(15)	SUST	10.38	117.90
	TR:Amb to T1{1}			2199	1.00	(17)	DISP	0.76	176.85
	Amb to T1{1}			2199	1.00	(17)	DISP	0.76	176.85
	Sus. + E1{1}	11060	8761		1.00	(16)	OCC	13.40	141.48
	Sus. + E2{1}	11060	8761		1.00	(16)	OCC	13.40	141.48
	Sus. + E3{1}	11060	6428		1.00	(16)	OCC	12.59	141.48
	Sus. + E4{1}	11060	6428		1.00	(16)	OCC	12.59	141.48
	Sus. + W1{1}	11060	7404		1.00	(16)	OCC	12.93	141.48
	Sus. + W2{1}	11060	7404		1.00	(16)	OCC	12.93	141.48
	Sus. + W3{1}	11060	5165		1.00	(16)	OCC	12.16	141.48
	Sus. + W4{1}	11060	5165		1.00	(16)	OCC	12.16	141.48
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ASME B31.1 (2014) CODE COMPLIANCE									
		(Moments in N.m )			(Stress in N/mm2 )				
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.	
A02 N+	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	5061			4.30	(15)	SUST	12.19	117.90
	TR:Amb to T1{1}			1823	4.30	(17)	DISP	2.70	176.85
	Amb to T1{1}			1823	4.30	(17)	DISP	2.70	176.85
	Sus. + E1{1}	5061	4756		4.30	(16)	OCC	17.47	141.48
	Sus. + E2{1}	5061	4756		4.30	(16)	OCC	17.47	141.48
	Sus. + E3{1}	5061	3861		4.30	(16)	OCC	16.48	141.48
	Sus. + E4{1}	5061	3861		4.30	(16)	OCC	16.48	141.48
	Sus. + W1{1}	5061	3777		4.30	(16)	OCC	16.39	141.48
	Sus. + W2{1}	5061	3777		4.30	(16)	OCC	16.39	141.48
	Sus. + W3{1}	5061	2830		4.30	(16)	OCC	15.33	141.48
	Sus. + W4{1}	5061	2830		4.30	(16)	OCC	15.33	141.48
A02 N-	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	5061			1.00	(15)	SUST	8.31	117.90
	TR:Amb to T1{1}			1823	1.00	(17)	DISP	0.63	176.85

	Amb to T1{1}			1823	1.00	(17)	DISP	0.63	176.85
	Sus. + E1{1}	5061	4756		1.00	(16)	OCC	9.95	141.48
	Sus. + E2{1}	5061	4756		1.00	(16)	OCC	9.95	141.48
	Sus. + E3{1}	5061	3861		1.00	(16)	OCC	9.64	141.48
	Sus. + E4{1}	5061	3861		1.00	(16)	OCC	9.64	141.48
	Sus. + W1{1}	5061	3777		1.00	(16)	OCC	9.61	141.48
	Sus. + W2{1}	5061	3777		1.00	(16)	OCC	9.61	141.48
	Sus. + W3{1}	5061	2830		1.00	(16)	OCC	9.28	141.48
	Sus. + W4{1}	5061	2830		1.00	(16)	OCC	9.28	141.48
A01	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	4181			1.00	(15)	SUST	8.00	117.90
	TR:Amb to T1{1}			1803	1.00	(17)	DISP	0.62	176.85
	Amb to T1{1}			1803	1.00	(17)	DISP	0.62	176.85
	Sus. + E1{1}	4181	2069		1.00	(16)	OCC	8.72	141.48
	Sus. + E2{1}	4181	2069		1.00	(16)	OCC	8.72	141.48
	Sus. + E3{1}	4181	3665		1.00	(16)	OCC	9.27	141.48
	Sus. + E4{1}	4181	3665		1.00	(16)	OCC	9.27	141.48
	Sus. + W1{1}	4181	1139		1.00	(16)	OCC	8.40	141.48
	Sus. + W2{1}	4181	1139		1.00	(16)	OCC	8.40	141.48
	Sus. + W3{1}	4181	2676		1.00	(16)	OCC	8.93	141.48
	Sus. + W4{1}	4181	2676		1.00	(16)	OCC	8.93	141.48

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R E S U L T     S U M M A R Y  
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Maximum sustained stress ratio

Point : A07 F  
Stress N/mm2 : 41.00  
Allowable N/mm2 : 117.90  
Ratio : 0.35  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A07 N  
Stress N/mm2 : 5.59  
Allowable N/mm2 : 176.85  
Ratio : 0.03  
Load combination : Max Range

Maximum occasional stress ratio

Point : A07 F  
Stress N/mm2 : 48.28  
Allowable N/mm2 : 141.48  
Ratio : 0.34  
Load combination : Sus. + E3{1}

Maximum hoop stress ratio

Point : A07 F  
Stress N/mm2 : 18.78  
Allowable N/mm2 : 117.90  
Ratio : 0.16  
Load combination : Max P{1}

## **LAMPIRAN L**

*GENERAL PIPE STRESS REPORT (OPERATING CONDITION  
WITHOUT EXPANSION JOINT, PIPE THICKNESS = 8,808 mm)*

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A02 N+	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	7196			4.30	(15) SUST	14.56	117.90
	TR:Amb to T1{1}			62202	4.30	(17) DISP	92.20	176.85
	Amb to T1{1}			62202	4.30	(17) DISP	92.20	176.85
	Sus. + E1{1}	7196	3160		4.30	(16) OCC	18.07	141.48
	Sus. + E2{1}	7196	3160		4.30	(16) OCC	18.07	141.48
	Sus. + E3{1}	7196	3903		4.30	(16) OCC	18.90	141.48
	Sus. + E4{1}	7196	3903		4.30	(16) OCC	18.90	141.48
	Sus. + W1{1}	7196	3034		4.30	(16) OCC	17.93	141.48
	Sus. + W2{1}	7196	3034		4.30	(16) OCC	17.93	141.48
	Sus. + W3{1}	7196	3252		4.30	(16) OCC	18.18	141.48
	Sus. + W4{1}	7196	3252		4.30	(16) OCC	18.18	141.48
A04 N+	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	9474			4.30	(15) SUST	17.09	117.90
	TR:Amb to T1{1}			35662	4.30	(17) DISP	52.86	176.85
	Amb to T1{1}			35662	4.30	(17) DISP	52.86	176.85
	Sus. + E1{1}	9474	5462		4.30	(16) OCC	23.16	141.48
	Sus. + E2{1}	9474	5462		4.30	(16) OCC	23.16	141.48
	Sus. + E3{1}	9474	2569		4.30	(16) OCC	19.95	141.48
	Sus. + E4{1}	9474	2569		4.30	(16) OCC	19.95	141.48
	Sus. + W1{1}	9474	6521		4.30	(16) OCC	24.34	141.48
	Sus. + W2{1}	9474	6521		4.30	(16) OCC	24.34	141.48
	Sus. + W3{1}	9474	2027		4.30	(16) OCC	19.35	141.48
	Sus. + W4{1}	9474	2027		4.30	(16) OCC	19.35	141.48
A07 N+	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	11378			8.08	(15) SUST	30.36	117.90
	TR:Amb to T1{1}			18142	8.08	(17) DISP	50.59	176.85
	Amb to T1{1}			18142	8.08	(17) DISP	50.59	176.85
	Sus. + E1{1}	11378	1522		8.08	(16) OCC	33.54	141.48
	Sus. + E2{1}	11378	1522		8.08	(16) OCC	33.54	141.48
	Sus. + E3{1}	11378	2441		8.08	(16) OCC	35.46	141.48
	Sus. + E4{1}	11378	2441		8.08	(16) OCC	35.46	141.48
	Sus. + W1{1}	11378	2381		8.08	(16) OCC	35.34	141.48
	Sus. + W2{1}	11378	2381		8.08	(16) OCC	35.34	141.48
	Sus. + W3{1}	11378	2568		8.08	(16) OCC	35.73	141.48
	Sus. + W4{1}	11378	2568		8.08	(16) OCC	35.73	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A07 F-	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	12121			8.08	(15) SUST	31.91	117.90
	TR:Amb to T1{1}			17598	8.08	(17) DISP	49.07	176.85
	Amb to T1{1}			17598	8.08	(17) DISP	49.07	176.85
	Sus. + E1{1}	12121	1623		8.08	(16) OCC	35.30	141.48
	Sus. + E2{1}	12121	1623		8.08	(16) OCC	35.30	141.48
	Sus. + E3{1}	12121	2160		8.08	(16) OCC	36.43	141.48
	Sus. + E4{1}	12121	2160		8.08	(16) OCC	36.43	141.48
	Sus. + W1{1}	12121	3167		8.08	(16) OCC	38.53	141.48
	Sus. + W2{1}	12121	3167		8.08	(16) OCC	38.53	141.48
	Sus. + W3{1}	12121	2265		8.08	(16) OCC	36.65	141.48
	Sus. + W4{1}	12121	2265		8.08	(16) OCC	36.65	141.48
A06 N+	Max P{1}					( 3) HOOP	18.78	117.90

GR + Max P{1}	13006		8.08	(15)	SUST	33.76	117.90
TR:Amb to T1{1}			12871	8.08	(17)	DISP	35.89 176.85
Amb to T1{1}			12871	8.08	(17)	DISP	35.89 176.85
Sus. + E1{1}	13006	4411		8.08	(16)	OCC	42.98 141.48
Sus. + E2{1}	13006	4411		8.08	(16)	OCC	42.98 141.48
Sus. + E3{1}	13006	3429		8.08	(16)	OCC	40.93 141.48
Sus. + E4{1}	13006	3429		8.08	(16)	OCC	40.93 141.48
Sus. + W1{1}	13006	5158		8.08	(16)	OCC	44.55 141.48
Sus. + W2{1}	13006	5158		8.08	(16)	OCC	44.55 141.48
Sus. + W3{1}	13006	4005		8.08	(16)	OCC	42.14 141.48
Sus. + W4{1}	13006	4005		8.08	(16)	OCC	42.14 141.48
A06 F- Max P{1}							
GR + Max P{1}	13080				( 3)	HOOP	18.78 117.90
TR:Amb to T1{1}				12653	8.08	(15)	SUST 33.92 117.90
Amb to T1{1}				12653	8.08	(17)	DISP 35.28 176.85
Sus. + E1{1}	13080	4400			8.08	(16)	OCC 43.12 141.48
Sus. + E2{1}	13080	4400			8.08	(16)	OCC 43.12 141.48
Sus. + E3{1}	13080	3562			8.08	(16)	OCC 41.36 141.48
Sus. + E4{1}	13080	3562			8.08	(16)	OCC 41.36 141.48
Sus. + W1{1}	13080	5067			8.08	(16)	OCC 44.51 141.48
Sus. + W2{1}	13080	5067			8.08	(16)	OCC 44.51 141.48
Sus. + W3{1}	13080	4137			8.08	(16)	OCC 42.57 141.48
Sus. + W4{1}	13080	4137			8.08	(16)	OCC 42.57 141.48
A02 F- Max P{1}							
GR + Max P{1}	9959				4.30	(15)	SUST 17.63 117.90
TR:Amb to T1{1}				29755	4.30	(17)	DISP 44.11 176.85
Amb to T1{1}				29755	4.30	(17)	DISP 44.11 176.85
Sus. + E1{1}	9959	2431			4.30	(16)	OCC 20.33 141.48
Sus. + E2{1}	9959	2431			4.30	(16)	OCC 20.33 141.48
Sus. + E3{1}	9959	4037			4.30	(16)	OCC 22.12 141.48
Sus. + E4{1}	9959	4037			4.30	(16)	OCC 22.12 141.48
Sus. + W1{1}	9959	2643			4.30	(16)	OCC 20.57 141.48
Sus. + W2{1}	9959	2643			4.30	(16)	OCC 20.57 141.48
Sus. + W3{1}	9959	3431			4.30	(16)	OCC 21.45 141.48
Sus. + W4{1}	9959	3431			4.30	(16)	OCC 21.45 141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	Moments in N.m			Stress in N/mm2			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A05 F- Max P{1}									
GR + Max P{1}		4382					( 3)	HOOP	18.78 117.90
TR:Amb to T1{1}					26374	4.30	(15)	SUST	11.43 117.90
Amb to T1{1}					26374	4.30	(17)	DISP	39.09 176.85
Sus. + E1{1}		4382	4031			4.30	(17)	DISP	39.09 176.85
Sus. + E2{1}		4382	4031			4.30	(16)	OCC	15.91 141.48
Sus. + E3{1}		4382	974			4.30	(16)	OCC	15.91 141.48
Sus. + E4{1}		4382	974			4.30	(16)	OCC	12.51 141.48
Sus. + W1{1}		4382	4891			4.30	(16)	OCC	16.87 141.48
Sus. + W2{1}		4382	4891			4.30	(16)	OCC	16.87 141.48
Sus. + W3{1}		4382	905			4.30	(16)	OCC	12.44 141.48
Sus. + W4{1}		4382	905			4.30	(16)	OCC	12.44 141.48
A05 N+ Max P{1}									
GR + Max P{1}		3298					( 3)	HOOP	18.78 117.90
TR:Amb to T1{1}					24680	4.30	(15)	SUST	10.23 117.90
Amb to T1{1}					24680	4.30	(17)	DISP	36.58 176.85
Sus. + E1{1}		3298	2656			4.30	(17)	DISP	36.58 176.85
Sus. + E2{1}		3298	2656			4.30	(16)	OCC	13.18 141.48
Sus. + E3{1}		3298	2121			4.30	(16)	OCC	13.18 141.48
Sus. + E4{1}		3298	2121			4.30	(16)	OCC	12.58 141.48
Sus. + W1{1}		3298	3132			4.30	(16)	OCC	12.58 141.48
Sus. + W2{1}		3298	3132			4.30	(16)	OCC	13.71 141.48
Sus. + W3{1}		3298	2468			4.30	(16)	OCC	12.97 141.48
Sus. + W4{1}		3298	2468			4.30	(16)	OCC	12.97 141.48
A09 F- Max P{1}									
GR + Max P{1}		22370					( 3)	HOOP	18.78 117.90
TR:Amb to T1{1}					7612	4.30	(15)	SUST	31.43 117.90
Amb to T1{1}					7612	4.30	(17)	DISP	11.28 176.85
Sus. + E1{1}		22370	664			4.30	(17)	DISP	11.28 176.85
						4.30	(16)	OCC	32.17 141.48

Sus. + E2{1}	22370	664	4.30	(16)	OCC	32.17	141.48
Sus. + E3{1}	22370	1017	4.30	(16)	OCC	32.56	141.48
Sus. + E4{1}	22370	1017	4.30	(16)	OCC	32.56	141.48
Sus. + W1{1}	22370	2014	4.30	(16)	OCC	33.67	141.48
Sus. + W2{1}	22370	2014	4.30	(16)	OCC	33.67	141.48
Sus. + W3{1}	22370	1036	4.30	(16)	OCC	32.58	141.48
Sus. + W4{1}	22370	1036	4.30	(16)	OCC	32.58	141.48

A04 F- Max P{1}				( 3)	HOOP	18.78	117.90	
GR + Max P{1}	4206		4.30	(15)	SUST	11.24	117.90	
TR:Amb to T1{1}			20736	4.30	(17)	DISP	30.74	176.85
Amb to T1{1}			20736	4.30	(17)	DISP	30.74	176.85
Sus. + E1{1}	4206	2981	4.30	(16)	OCC	14.55	141.48	
Sus. + E2{1}	4206	2981	4.30	(16)	OCC	14.55	141.48	
Sus. + E3{1}	4206	2080	4.30	(16)	OCC	13.55	141.48	
Sus. + E4{1}	4206	2080	4.30	(16)	OCC	13.55	141.48	
Sus. + W1{1}	4206	3441	4.30	(16)	OCC	15.06	141.48	
Sus. + W2{1}	4206	3441	4.30	(16)	OCC	15.06	141.48	
Sus. + W3{1}	4206	1905	4.30	(16)	OCC	13.35	141.48	
Sus. + W4{1}	4206	1905	4.30	(16)	OCC	13.35	141.48	

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type		
A10 + Max P{1}						( 3) HOOP	18.78	117.90
GR + Max P{1}		61827			1.00	(15) SUST	27.89	117.90
TR:Amb to T1{1}				12327	1.00	(17) DISP	4.25	176.85
Amb to T1{1}				12327	1.00	(17) DISP	4.25	176.85
Sus. + E1{1}		61827	342		1.00	(16) OCC	28.01	141.48
Sus. + E2{1}		61827	342		1.00	(16) OCC	28.01	141.48
Sus. + E3{1}		61827	953		1.00	(16) OCC	28.22	141.48
Sus. + E4{1}		61827	953		1.00	(16) OCC	28.22	141.48
Sus. + W1{1}		61827	1974		1.00	(16) OCC	28.57	141.48
Sus. + W2{1}		61827	1974		1.00	(16) OCC	28.57	141.48
Sus. + W3{1}		61827	1121		1.00	(16) OCC	28.28	141.48
Sus. + W4{1}		61827	1121		1.00	(16) OCC	28.28	141.48
A10 - Max P{1}						( 3) HOOP	18.78	117.90
GR + Max P{1}		61827			1.00	(15) SUST	27.89	117.90
TR:Amb to T1{1}				12327	1.00	(17) DISP	4.25	176.85
Amb to T1{1}				12327	1.00	(17) DISP	4.25	176.85
Sus. + E1{1}		61827	342		1.00	(16) OCC	28.01	141.48
Sus. + E2{1}		61827	342		1.00	(16) OCC	28.01	141.48
Sus. + E3{1}		61827	953		1.00	(16) OCC	28.22	141.48
Sus. + E4{1}		61827	953		1.00	(16) OCC	28.22	141.48
Sus. + W1{1}		61827	1974		1.00	(16) OCC	28.57	141.48
Sus. + W2{1}		61827	1974		1.00	(16) OCC	28.57	141.48
Sus. + W3{1}		61827	1121		1.00	(16) OCC	28.28	141.48
Sus. + W4{1}		61827	1121		1.00	(16) OCC	28.28	141.48
A11 F- Max P{1}						( 3) HOOP	18.78	117.90
GR + Max P{1}		10221			4.30	(15) SUST	17.92	117.90
TR:Amb to T1{1}				5524	4.30	(17) DISP	8.19	176.85
Amb to T1{1}				5524	4.30	(17) DISP	8.19	176.85
Sus. + E1{1}		10221	2252		4.30	(16) OCC	20.43	141.48
Sus. + E2{1}		10221	2252		4.30	(16) OCC	20.43	141.48
Sus. + E3{1}		10221	2555		4.30	(16) OCC	20.76	141.48
Sus. + E4{1}		10221	2555		4.30	(16) OCC	20.76	141.48
Sus. + W1{1}		10221	5514		4.30	(16) OCC	24.05	141.48
Sus. + W2{1}		10221	5514		4.30	(16) OCC	24.05	141.48
Sus. + W3{1}		10221	3054		4.30	(16) OCC	21.32	141.48
Sus. + W4{1}		10221	3054		4.30	(16) OCC	21.32	141.48
A09 N+ Max P{1}						( 3) HOOP	18.78	117.90
GR + Max P{1}		12006			4.30	(15) SUST	19.91	117.90
TR:Amb to T1{1}				9648	4.30	(17) DISP	14.30	176.85
Amb to T1{1}				9648	4.30	(17) DISP	14.30	176.85
Sus. + E1{1}		12006	1523		4.30	(16) OCC	21.60	141.48
Sus. + E2{1}		12006	1523		4.30	(16) OCC	21.60	141.48
Sus. + E3{1}		12006	983		4.30	(16) OCC	21.00	141.48
Sus. + E4{1}		12006	983		4.30	(16) OCC	21.00	141.48
Sus. + W1{1}		12006	978		4.30	(16) OCC	20.99	141.48

Sus. + W2{1}	12006	978	4.30	(16)	OCC	20.99	141.48
Sus. + W3{1}	12006	1190	4.30	(16)	OCC	21.23	141.48
Sus. + W4{1}	12006	1190	4.30	(16)	OCC	21.23	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )	Ma (Sus.)	Mb (Occ.)			
A02 N-	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	7196			1.00	(15) SUST	9.04	117.90
	TR:Amb to Tl{1}			62202	1.00	(17) DISP	21.46	176.85
	Amb to Tl{1}			62202	1.00	(17) DISP	21.46	176.85
	Sus. + E1{1}	7196	3160		1.00	(16) OCC	10.13	141.48
	Sus. + E2{1}	7196	3160		1.00	(16) OCC	10.13	141.48
	Sus. + E3{1}	7196	3903		1.00	(16) OCC	10.39	141.48
	Sus. + E4{1}	7196	3903		1.00	(16) OCC	10.39	141.48
	Sus. + W1{1}	7196	3034		1.00	(16) OCC	10.09	141.48
	Sus. + W2{1}	7196	3034		1.00	(16) OCC	10.09	141.48
	Sus. + W3{1}	7196	3252		1.00	(16) OCC	10.17	141.48
	Sus. + W4{1}	7196	3252		1.00	(16) OCC	10.17	141.48
A14 F-	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	4482			4.30	(15) SUST	11.54	117.90
	TR:Amb to Tl{1}			2726	4.30	(17) DISP	4.04	176.85
	Amb to Tl{1}			2726	4.30	(17) DISP	4.04	176.85
	Sus. + E1{1}	4482	5171		4.30	(16) OCC	17.29	141.48
	Sus. + E2{1}	4482	5171		4.30	(16) OCC	17.29	141.48
	Sus. + E3{1}	4482	2589		4.30	(16) OCC	14.42	141.48
	Sus. + E4{1}	4482	2589		4.30	(16) OCC	14.42	141.48
	Sus. + W1{1}	4482	8819		4.30	(16) OCC	21.35	141.48
	Sus. + W2{1}	4482	8819		4.30	(16) OCC	21.35	141.48
	Sus. + W3{1}	4482	4210		4.30	(16) OCC	16.22	141.48
	Sus. + W4{1}	4482	4210		4.30	(16) OCC	16.22	141.48
A00	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	9065			1.00	(15) SUST	9.69	117.90
	TR:Amb to Tl{1}			61848	1.00	(17) DISP	21.34	176.85
	Amb to Tl{1}			61848	1.00	(17) DISP	21.34	176.85
	Sus. + E1{1}	9065	6795		1.00	(16) OCC	12.03	141.48
	Sus. + E2{1}	9065	6795		1.00	(16) OCC	12.03	141.48
	Sus. + E3{1}	9065	6803		1.00	(16) OCC	12.04	141.48
	Sus. + E4{1}	9065	6803		1.00	(16) OCC	12.04	141.48
	Sus. + W1{1}	9065	6255		1.00	(16) OCC	11.85	141.48
	Sus. + W2{1}	9065	6255		1.00	(16) OCC	11.85	141.48
	Sus. + W3{1}	9065	5522		1.00	(16) OCC	11.59	141.48
	Sus. + W4{1}	9065	5522		1.00	(16) OCC	11.59	141.48
A03 +	Max P{1}					( 3) HOOP	18.78	117.90
	GR + Max P{1}	25291			1.00	(15) SUST	15.29	117.90
	TR:Amb to Tl{1}			59688	1.00	(17) DISP	20.59	176.85
	Amb to Tl{1}			59688	1.00	(17) DISP	20.59	176.85
	Sus. + E1{1}	25291	4867		1.00	(16) OCC	16.97	141.48
	Sus. + E2{1}	25291	4867		1.00	(16) OCC	16.97	141.48
	Sus. + E3{1}	25291	11928		1.00	(16) OCC	19.40	141.48
	Sus. + E4{1}	25291	11928		1.00	(16) OCC	19.40	141.48
	Sus. + W1{1}	25291	5893		1.00	(16) OCC	17.32	141.48
	Sus. + W2{1}	25291	5893		1.00	(16) OCC	17.32	141.48
	Sus. + W3{1}	25291	10442		1.00	(16) OCC	18.89	141.48
	Sus. + W4{1}	25291	10442		1.00	(16) OCC	18.89	141.48

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Point	Load	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load	Code	Code
		(Moments in N.m )	(Stress in N/mm2 )	Ma	Mb			



name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no.	type	Stress	Allow.
A03	- Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	25291			1.00	(15)	SUST	15.29	117.90
	TR:Amb to T1{1}			59688	1.00	(17)	DISP	20.59	176.85
	Amb to T1{1}			59688	1.00	(17)	DISP	20.59	176.85
	Sus. + E1{1}	25291	4867		1.00	(16)	OCC	16.97	141.48
	Sus. + E2{1}	25291	4867		1.00	(16)	OCC	16.97	141.48
	Sus. + E3{1}	25291	11928		1.00	(16)	OCC	19.40	141.48
	Sus. + E4{1}	25291	11928		1.00	(16)	OCC	19.40	141.48
	Sus. + W1{1}	25291	5893		1.00	(16)	OCC	17.32	141.48
	Sus. + W2{1}	25291	5893		1.00	(16)	OCC	17.32	141.48
	Sus. + W3{1}	25291	10442		1.00	(16)	OCC	18.89	141.48
	Sus. + W4{1}	25291	10442		1.00	(16)	OCC	18.89	141.48
A08	+ Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	9775			1.00	(15)	SUST	9.93	117.90
	TR:Amb to T1{1}			28922	1.00	(17)	DISP	9.98	176.85
	Amb to T1{1}			28922	1.00	(17)	DISP	9.98	176.85
	Sus. + E1{1}	9775	18762		1.00	(16)	OCC	16.41	141.48
	Sus. + E2{1}	9775	18762		1.00	(16)	OCC	16.41	141.48
	Sus. + E3{1}	9775	12220		1.00	(16)	OCC	14.15	141.48
	Sus. + E4{1}	9775	12220		1.00	(16)	OCC	14.15	141.48
	Sus. + W1{1}	9775	28878		1.00	(16)	OCC	19.90	141.48
	Sus. + W2{1}	9775	28878		1.00	(16)	OCC	19.90	141.48
	Sus. + W3{1}	9775	14234		1.00	(16)	OCC	14.84	141.48
	Sus. + W4{1}	9775	14234		1.00	(16)	OCC	14.84	141.48
A08	- Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	9775			1.00	(15)	SUST	9.93	117.90
	TR:Amb to T1{1}			28922	1.00	(17)	DISP	9.98	176.85
	Amb to T1{1}			28922	1.00	(17)	DISP	9.98	176.85
	Sus. + E1{1}	9775	18762		1.00	(16)	OCC	16.41	141.48
	Sus. + E2{1}	9775	18762		1.00	(16)	OCC	16.41	141.48
	Sus. + E3{1}	9775	12220		1.00	(16)	OCC	14.15	141.48
	Sus. + E4{1}	9775	12220		1.00	(16)	OCC	14.15	141.48
	Sus. + W1{1}	9775	28878		1.00	(16)	OCC	19.90	141.48
	Sus. + W2{1}	9775	28878		1.00	(16)	OCC	19.90	141.48
	Sus. + W3{1}	9775	14234		1.00	(16)	OCC	14.84	141.48
	Sus. + W4{1}	9775	14234		1.00	(16)	OCC	14.84	141.48
A15	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	2895			1.00	(15)	SUST	7.56	117.90
	TR:Amb to T1{1}			3115	1.00	(17)	DISP	1.07	176.85
	Amb to T1{1}			3115	1.00	(17)	DISP	1.07	176.85
	Sus. + E1{1}	2895	11305		1.00	(16)	OCC	11.46	141.48
	Sus. + E2{1}	2895	11305		1.00	(16)	OCC	11.46	141.48
	Sus. + E3{1}	2895	11222		1.00	(16)	OCC	11.43	141.48
	Sus. + E4{1}	2895	11222		1.00	(16)	OCC	11.43	141.48
	Sus. + W1{1}	2895	21855		1.00	(16)	OCC	15.10	141.48
	Sus. + W2{1}	2895	21855		1.00	(16)	OCC	15.10	141.48
	Sus. + W3{1}	2895	17223		1.00	(16)	OCC	13.50	141.48
	Sus. + W4{1}	2895	17223		1.00	(16)	OCC	13.50	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type		
A14 F+	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	4482			1.00	(15)	SUST	8.11	117.90
	TR:Amb to T1{1}			2726	1.00	(17)	DISP	0.94	176.85
	Amb to T1{1}			2726	1.00	(17)	DISP	0.94	176.85
	Sus. + E1{1}	4482	5171		1.00	(16)	OCC	9.89	141.48
	Sus. + E2{1}	4482	5171		1.00	(16)	OCC	9.89	141.48
	Sus. + E3{1}	4482	2589		1.00	(16)	OCC	9.00	141.48
	Sus. + E4{1}	4482	2589		1.00	(16)	OCC	9.00	141.48
	Sus. + W1{1}	4482	8819		1.00	(16)	OCC	11.15	141.48
	Sus. + W2{1}	4482	8819		1.00	(16)	OCC	11.15	141.48
	Sus. + W3{1}	4482	4210		1.00	(16)	OCC	9.56	141.48
	Sus. + W4{1}	4482	4210		1.00	(16)	OCC	9.56	141.48
A14 N+	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	1815			4.30	(15)	SUST	8.58	117.90

TR:Amb to T1{1}			1958	4.30	(17)	DISP	2.90	176.85		
Amb to T1{1}			1958	4.30	(17)	DISP	2.90	176.85		
Sus. + E1{1}	1815	3907		4.30	(16)	OCC	12.92	141.48		
Sus. + E2{1}	1815	3907		4.30	(16)	OCC	12.92	141.48		
Sus. + E3{1}	1815	2084		4.30	(16)	OCC	10.90	141.48		
Sus. + E4{1}	1815	2084		4.30	(16)	OCC	10.90	141.48		
Sus. + W1{1}	1815	6146		4.30	(16)	OCC	15.41	141.48		
Sus. + W2{1}	1815	6146		4.30	(16)	OCC	15.41	141.48		
Sus. + W3{1}	1815	3555		4.30	(16)	OCC	12.53	141.48		
Sus. + W4{1}	1815	3555		4.30	(16)	OCC	12.53	141.48		
A14 N- Max P{1}							( 3)	HOOP	18.78	117.90
GR + Max P{1}	1815			1.00	(15)	SUST	7.19	117.90		
TR:Amb to T1{1}			1958	1.00	(17)	DISP	0.68	176.85		
Amb to T1{1}			1958	1.00	(17)	DISP	0.68	176.85		
Sus. + E1{1}	1815	3907		1.00	(16)	OCC	8.53	141.48		
Sus. + E2{1}	1815	3907		1.00	(16)	OCC	8.53	141.48		
Sus. + E3{1}	1815	2084		1.00	(16)	OCC	7.91	141.48		
Sus. + E4{1}	1815	2084		1.00	(16)	OCC	7.91	141.48		
Sus. + W1{1}	1815	6146		1.00	(16)	OCC	9.31	141.48		
Sus. + W2{1}	1815	6146		1.00	(16)	OCC	9.31	141.48		
Sus. + W3{1}	1815	3555		1.00	(16)	OCC	8.41	141.48		
Sus. + W4{1}	1815	3555		1.00	(16)	OCC	8.41	141.48		
A13 F+ Max P{1}							( 3)	HOOP	18.78	117.90
GR + Max P{1}	4936			1.00	(15)	SUST	8.26	117.90		
TR:Amb to T1{1}			3293	1.00	(17)	DISP	1.14	176.85		
Amb to T1{1}			3293	1.00	(17)	DISP	1.14	176.85		
Sus. + E1{1}	4936	2886		1.00	(16)	OCC	9.26	141.48		
Sus. + E2{1}	4936	2886		1.00	(16)	OCC	9.26	141.48		
Sus. + E3{1}	4936	1326		1.00	(16)	OCC	8.72	141.48		
Sus. + E4{1}	4936	1326		1.00	(16)	OCC	8.72	141.48		
Sus. + W1{1}	4936	5634		1.00	(16)	OCC	10.21	141.48		
Sus. + W2{1}	4936	5634		1.00	(16)	OCC	10.21	141.48		
Sus. + W3{1}	4936	2067		1.00	(16)	OCC	8.98	141.48		
Sus. + W4{1}	4936	2067		1.00	(16)	OCC	8.98	141.48		

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ASME B31.1 (2014) CODE COMPLIANCE									
(Moments in N.m )			(Stress in N/mm2 )						
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Code type	Code Stress	Code Allow.
-----									
A13 F-	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	4936			4.30	(15)	SUST	12.05	117.90
	TR:Amb to T1{1}			3293	4.30	(17)	DISP	4.88	176.85
	Amb to T1{1}			3293	4.30	(17)	DISP	4.88	176.85
	Sus. + E1{1}	4936	2886		4.30	(16)	OCC	15.26	141.48
	Sus. + E2{1}	4936	2886		4.30	(16)	OCC	15.26	141.48
	Sus. + E3{1}	4936	1326		4.30	(16)	OCC	13.52	141.48
	Sus. + E4{1}	4936	1326		4.30	(16)	OCC	13.52	141.48
	Sus. + W1{1}	4936	5634		4.30	(16)	OCC	18.31	141.48
	Sus. + W2{1}	4936	5634		4.30	(16)	OCC	18.31	141.48
	Sus. + W3{1}	4936	2067		4.30	(16)	OCC	14.35	141.48
	Sus. + W4{1}	4936	2067		4.30	(16)	OCC	14.35	141.48
-----									
A13 N+	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	2299			4.30	(15)	SUST	9.12	117.90
	TR:Amb to T1{1}			4157	4.30	(17)	DISP	6.16	176.85
	Amb to T1{1}			4157	4.30	(17)	DISP	6.16	176.85
	Sus. + E1{1}	2299	3751		4.30	(16)	OCC	13.29	141.48
	Sus. + E2{1}	2299	3751		4.30	(16)	OCC	13.29	141.48
	Sus. + E3{1}	2299	1651		4.30	(16)	OCC	10.95	141.48
	Sus. + E4{1}	2299	1651		4.30	(16)	OCC	10.95	141.48
	Sus. + W1{1}	2299	7519		4.30	(16)	OCC	17.48	141.48
	Sus. + W2{1}	2299	7519		4.30	(16)	OCC	17.48	141.48
	Sus. + W3{1}	2299	2851		4.30	(16)	OCC	12.29	141.48
	Sus. + W4{1}	2299	2851		4.30	(16)	OCC	12.29	141.48
-----									
A13 N-	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	2299			1.00	(15)	SUST	7.35	117.90
	TR:Amb to T1{1}			4157	1.00	(17)	DISP	1.43	176.85
	Amb to T1{1}			4157	1.00	(17)	DISP	1.43	176.85
	Sus. + E1{1}	2299	3751		1.00	(16)	OCC	8.65	141.48
	Sus. + E2{1}	2299	3751		1.00	(16)	OCC	8.65	141.48

Sus. + E3{1}	2299	1651	1.00	(16)	OCC	7.92	141.48
Sus. + E4{1}	2299	1651	1.00	(16)	OCC	7.92	141.48
Sus. + W1{1}	2299	7519	1.00	(16)	OCC	9.95	141.48
Sus. + W2{1}	2299	7519	1.00	(16)	OCC	9.95	141.48
Sus. + W3{1}	2299	2851	1.00	(16)	OCC	8.34	141.48
Sus. + W4{1}	2299	2851	1.00	(16)	OCC	8.34	141.48

A12 + Max P{1}				( 3)	HOOP	18.78	117.90
GR + Max P{1}	10555			1.00	(15)	SUST	10.20 117.90
TR:Amb to T1{1}			5608	1.00	(17)	DISP	1.93 176.85
Amb to T1{1}			5608	1.00	(17)	DISP	1.93 176.85
Sus. + E1{1}	10555	2334		1.00	(16)	OCC	11.01 141.48
Sus. + E2{1}	10555	2334		1.00	(16)	OCC	11.01 141.48
Sus. + E3{1}	10555	2802		1.00	(16)	OCC	11.17 141.48
Sus. + E4{1}	10555	2802		1.00	(16)	OCC	11.17 141.48
Sus. + W1{1}	10555	5635		1.00	(16)	OCC	12.15 141.48
Sus. + W2{1}	10555	5635		1.00	(16)	OCC	12.15 141.48
Sus. + W3{1}	10555	3243		1.00	(16)	OCC	11.32 141.48
Sus. + W4{1}	10555	3243		1.00	(16)	OCC	11.32 141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Moments in N.m )		(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F					
A12 - Max P{1}								( 3) HOOP	18.78	117.90
GR + Max P{1}		10555					1.00	(15) SUST	10.20	117.90
TR:Amb to T1{1}						5608	1.00	(17) DISP	1.93	176.85
Amb to T1{1}						5608	1.00	(17) DISP	1.93	176.85
Sus. + E1{1}		10555	2334				1.00	(16) OCC	11.01	141.48
Sus. + E2{1}		10555	2334				1.00	(16) OCC	11.01	141.48
Sus. + E3{1}		10555	2802				1.00	(16) OCC	11.17	141.48
Sus. + E4{1}		10555	2802				1.00	(16) OCC	11.17	141.48
Sus. + W1{1}		10555	5635				1.00	(16) OCC	12.15	141.48
Sus. + W2{1}		10555	5635				1.00	(16) OCC	12.15	141.48
Sus. + W3{1}		10555	3243				1.00	(16) OCC	11.32	141.48
Sus. + W4{1}		10555	3243				1.00	(16) OCC	11.32	141.48
A11 F+ Max P{1}								( 3) HOOP	18.78	117.90
GR + Max P{1}		10221					1.00	(15) SUST	10.09	117.90
TR:Amb to T1{1}						5524	1.00	(17) DISP	1.91	176.85
Amb to T1{1}						5524	1.00	(17) DISP	1.91	176.85
Sus. + E1{1}		10221	2252				1.00	(16) OCC	10.86	141.48
Sus. + E2{1}		10221	2252				1.00	(16) OCC	10.86	141.48
Sus. + E3{1}		10221	2555				1.00	(16) OCC	10.97	141.48
Sus. + E4{1}		10221	2555				1.00	(16) OCC	10.97	141.48
Sus. + W1{1}		10221	5514				1.00	(16) OCC	11.99	141.48
Sus. + W2{1}		10221	5514				1.00	(16) OCC	11.99	141.48
Sus. + W3{1}		10221	3054				1.00	(16) OCC	11.14	141.48
Sus. + W4{1}		10221	3054				1.00	(16) OCC	11.14	141.48
A11 N+ Max P{1}								( 3) HOOP	18.78	117.90
GR + Max P{1}		7648					4.30	(15) SUST	15.06	117.90
TR:Amb to T1{1}						8206	4.30	(17) DISP	12.16	176.85
Amb to T1{1}						8206	4.30	(17) DISP	12.16	176.85
Sus. + E1{1}		7648	947				4.30	(16) OCC	16.12	141.48
Sus. + E2{1}		7648	947				4.30	(16) OCC	16.12	141.48
Sus. + E3{1}		7648	566				4.30	(16) OCC	15.69	141.48
Sus. + E4{1}		7648	566				4.30	(16) OCC	15.69	141.48
Sus. + W1{1}		7648	2970				4.30	(16) OCC	18.37	141.48
Sus. + W2{1}		7648	2970				4.30	(16) OCC	18.37	141.48
Sus. + W3{1}		7648	1225				4.30	(16) OCC	16.42	141.48
Sus. + W4{1}		7648	1225				4.30	(16) OCC	16.42	141.48
A11 N- Max P{1}								( 3) HOOP	18.78	117.90
GR + Max P{1}		7648					1.00	(15) SUST	9.20	117.90
TR:Amb to T1{1}						8206	1.00	(17) DISP	2.83	176.85
Amb to T1{1}						8206	1.00	(17) DISP	2.83	176.85
Sus. + E1{1}		7648	947				1.00	(16) OCC	9.53	141.48
Sus. + E2{1}		7648	947				1.00	(16) OCC	9.53	141.48
Sus. + E3{1}		7648	566				1.00	(16) OCC	9.39	141.48
Sus. + E4{1}		7648	566				1.00	(16) OCC	9.39	141.48
Sus. + W1{1}		7648	2970				1.00	(16) OCC	10.22	141.48
Sus. + W2{1}		7648	2970				1.00	(16) OCC	10.22	141.48

Sus. + W3{1}	7648	1225	1.00	(16)	OCC	9.62	141.48
Sus. + W4{1}	7648	1225	1.00	(16)	OCC	9.62	141.48

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		ASME B31.1 (2014)		CODE COMPLIANCE			
		(Moments in N.m )		(Stress in N/mm2 )			
Point	Load	Ma	Mb	Mc	Eq. Load	Code	Code
name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no. type	Stress Allow.
A09 F+	Max P{1}					( 3) HOOP	18.78 117.90
	GR + Max P{1}	22370			1.00	(15) SUST	14.28 117.90
	TR:Amb to T1{1}			7612	1.00	(17) DISP	2.63 176.85
	Amb to T1{1}			7612	1.00	(17) DISP	2.63 176.85
	Sus. + E1{1}	22370	664		1.00	(16) OCC	14.51 141.48
	Sus. + E2{1}	22370	664		1.00	(16) OCC	14.51 141.48
	Sus. + E3{1}	22370	1017		1.00	(16) OCC	14.63 141.48
	Sus. + E4{1}	22370	1017		1.00	(16) OCC	14.63 141.48
	Sus. + W1{1}	22370	2014		1.00	(16) OCC	14.97 141.48
	Sus. + W2{1}	22370	2014		1.00	(16) OCC	14.97 141.48
	Sus. + W3{1}	22370	1036		1.00	(16) OCC	14.64 141.48
	Sus. + W4{1}	22370	1036		1.00	(16) OCC	14.64 141.48
A09 N-	Max P{1}					( 3) HOOP	18.78 117.90
	GR + Max P{1}	12006			1.00	(15) SUST	10.70 117.90
	TR:Amb to T1{1}			9648	1.00	(17) DISP	3.33 176.85
	Amb to T1{1}			9648	1.00	(17) DISP	3.33 176.85
	Sus. + E1{1}	12006	1523		1.00	(16) OCC	11.23 141.48
	Sus. + E2{1}	12006	1523		1.00	(16) OCC	11.23 141.48
	Sus. + E3{1}	12006	983		1.00	(16) OCC	11.04 141.48
	Sus. + E4{1}	12006	983		1.00	(16) OCC	11.04 141.48
	Sus. + W1{1}	12006	978		1.00	(16) OCC	11.04 141.48
	Sus. + W2{1}	12006	978		1.00	(16) OCC	11.04 141.48
	Sus. + W3{1}	12006	1190		1.00	(16) OCC	11.11 141.48
	Sus. + W4{1}	12006	1190		1.00	(16) OCC	11.11 141.48
A07 F+	Max P{1}					( 3) HOOP	18.78 117.90
	GR + Max P{1}	12121			1.00	(15) SUST	10.74 117.90
	TR:Amb to T1{1}			17598	1.00	(17) DISP	6.07 176.85
	Amb to T1{1}			17598	1.00	(17) DISP	6.07 176.85
	Sus. + E1{1}	12121	1623		1.00	(16) OCC	11.30 141.48
	Sus. + E2{1}	12121	1623		1.00	(16) OCC	11.30 141.48
	Sus. + E3{1}	12121	2160		1.00	(16) OCC	11.49 141.48
	Sus. + E4{1}	12121	2160		1.00	(16) OCC	11.49 141.48
	Sus. + W1{1}	12121	3167		1.00	(16) OCC	11.83 141.48
	Sus. + W2{1}	12121	3167		1.00	(16) OCC	11.83 141.48
	Sus. + W3{1}	12121	2265		1.00	(16) OCC	11.52 141.48
	Sus. + W4{1}	12121	2265		1.00	(16) OCC	11.52 141.48
A07 N-	Max P{1}					( 3) HOOP	18.78 117.90
	GR + Max P{1}	11378			1.00	(15) SUST	10.49 117.90
	TR:Amb to T1{1}			18142	1.00	(17) DISP	6.26 176.85
	Amb to T1{1}			18142	1.00	(17) DISP	6.26 176.85
	Sus. + E1{1}	11378	1522		1.00	(16) OCC	11.01 141.48
	Sus. + E2{1}	11378	1522		1.00	(16) OCC	11.01 141.48
	Sus. + E3{1}	11378	2441		1.00	(16) OCC	11.33 141.48
	Sus. + E4{1}	11378	2441		1.00	(16) OCC	11.33 141.48
	Sus. + W1{1}	11378	2381		1.00	(16) OCC	11.31 141.48
	Sus. + W2{1}	11378	2381		1.00	(16) OCC	11.31 141.48
	Sus. + W3{1}	11378	2568		1.00	(16) OCC	11.37 141.48
	Sus. + W4{1}	11378	2568		1.00	(16) OCC	11.37 141.48

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		ASME B31.1 (2014)		CODE COMPLIANCE			
		(Moments in N.m )		(Stress in N/mm2 )			
Point	Load	Ma	Mb	Mc	Eq. Load	Code	Code
name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no. type	Stress Allow.

-----									
A06 F+	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	13080				1.00	(15) SUST	11.07	117.90
	TR:Amb to T1{1}			12653		1.00	(17) DISP	4.37	176.85
	Amb to T1{1}			12653		1.00	(17) DISP	4.37	176.85
	Sus. + E1{1}	13080	4400			1.00	(16) OCC	12.59	141.48
	Sus. + E2{1}	13080	4400			1.00	(16) OCC	12.59	141.48
	Sus. + E3{1}	13080	3562			1.00	(16) OCC	12.30	141.48
	Sus. + E4{1}	13080	3562			1.00	(16) OCC	12.30	141.48
	Sus. + W1{1}	13080	5067			1.00	(16) OCC	12.82	141.48
	Sus. + W2{1}	13080	5067			1.00	(16) OCC	12.82	141.48
	Sus. + W3{1}	13080	4137			1.00	(16) OCC	12.50	141.48
	Sus. + W4{1}	13080	4137			1.00	(16) OCC	12.50	141.48
A06 N-	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	13006				1.00	(15) SUST	11.05	117.90
	TR:Amb to T1{1}			12871		1.00	(17) DISP	4.44	176.85
	Amb to T1{1}			12871		1.00	(17) DISP	4.44	176.85
	Sus. + E1{1}	13006	4411			1.00	(16) OCC	12.57	141.48
	Sus. + E2{1}	13006	4411			1.00	(16) OCC	12.57	141.48
	Sus. + E3{1}	13006	3429			1.00	(16) OCC	12.23	141.48
	Sus. + E4{1}	13006	3429			1.00	(16) OCC	12.23	141.48
	Sus. + W1{1}	13006	5158			1.00	(16) OCC	12.83	141.48
	Sus. + W2{1}	13006	5158			1.00	(16) OCC	12.83	141.48
	Sus. + W3{1}	13006	4005			1.00	(16) OCC	12.43	141.48
	Sus. + W4{1}	13006	4005			1.00	(16) OCC	12.43	141.48
A05 F+	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	4382				1.00	(15) SUST	8.07	117.90
	TR:Amb to T1{1}			26374		1.00	(17) DISP	9.10	176.85
	Amb to T1{1}			26374		1.00	(17) DISP	9.10	176.85
	Sus. + E1{1}	4382	4031			1.00	(16) OCC	9.46	141.48
	Sus. + E2{1}	4382	4031			1.00	(16) OCC	9.46	141.48
	Sus. + E3{1}	4382	974			1.00	(16) OCC	8.41	141.48
	Sus. + E4{1}	4382	974			1.00	(16) OCC	8.41	141.48
	Sus. + W1{1}	4382	4891			1.00	(16) OCC	9.76	141.48
	Sus. + W2{1}	4382	4891			1.00	(16) OCC	9.76	141.48
	Sus. + W3{1}	4382	905			1.00	(16) OCC	8.38	141.48
	Sus. + W4{1}	4382	905			1.00	(16) OCC	8.38	141.48
A05 N-	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	3298				1.00	(15) SUST	7.70	117.90
	TR:Amb to T1{1}			24680		1.00	(17) DISP	8.51	176.85
	Amb to T1{1}			24680		1.00	(17) DISP	8.51	176.85
	Sus. + E1{1}	3298	2656			1.00	(16) OCC	8.61	141.48
	Sus. + E2{1}	3298	2656			1.00	(16) OCC	8.61	141.48
	Sus. + E3{1}	3298	2121			1.00	(16) OCC	8.43	141.48
	Sus. + E4{1}	3298	2121			1.00	(16) OCC	8.43	141.48
	Sus. + W1{1}	3298	3132			1.00	(16) OCC	8.78	141.48
	Sus. + W2{1}	3298	3132			1.00	(16) OCC	8.78	141.48
	Sus. + W3{1}	3298	2468			1.00	(16) OCC	8.55	141.48
	Sus. + W4{1}	3298	2468			1.00	(16) OCC	8.55	141.48
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ASME B31.1 (2014) CODE COMPLIANCE									
(Moments in N.m ) (Stress in N/mm2 )									
Point	Load	Ma	Mb	Mc	S.I.F	Eq. Load	Code	Code	
name	combination	(Sus.)	(Occ.)	(Exp.)		no. type	Stress	Allow.	
-----									
A04 F+	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	4206				1.00	(15) SUST	8.01	117.90
	TR:Amb to T1{1}			20736		1.00	(17) DISP	7.15	176.85
	Amb to T1{1}			20736		1.00	(17) DISP	7.15	176.85
	Sus. + E1{1}	4206	2981			1.00	(16) OCC	9.04	141.48
	Sus. + E2{1}	4206	2981			1.00	(16) OCC	9.04	141.48
	Sus. + E3{1}	4206	2080			1.00	(16) OCC	8.73	141.48
	Sus. + E4{1}	4206	2080			1.00	(16) OCC	8.73	141.48
	Sus. + W1{1}	4206	3441			1.00	(16) OCC	9.20	141.48
	Sus. + W2{1}	4206	3441			1.00	(16) OCC	9.20	141.48
	Sus. + W3{1}	4206	1905			1.00	(16) OCC	8.67	141.48
	Sus. + W4{1}	4206	1905			1.00	(16) OCC	8.67	141.48
A04 N-	Max P{1}					( 3)	HOOP	18.78	117.90
	GR + Max P{1}	9474				1.00	(15) SUST	9.83	117.90
	TR:Amb to T1{1}			35662		1.00	(17) DISP	12.30	176.85
-----									

Amb to T1{1}			35662	1.00	(17)	DISP	12.30	176.85
Sus. + E1{1}	9474	5462		1.00	(16)	OCC	11.71	141.48
Sus. + E2{1}	9474	5462		1.00	(16)	OCC	11.71	141.48
Sus. + E3{1}	9474	2569		1.00	(16)	OCC	10.72	141.48
Sus. + E4{1}	9474	2569		1.00	(16)	OCC	10.72	141.48
Sus. + W1{1}	9474	6521		1.00	(16)	OCC	12.08	141.48
Sus. + W2{1}	9474	6521		1.00	(16)	OCC	12.08	141.48
Sus. + W3{1}	9474	2027		1.00	(16)	OCC	10.53	141.48
Sus. + W4{1}	9474	2027		1.00	(16)	OCC	10.53	141.48
-----								
A02 F+ Max P{1}					( 3)	HOOP	18.78	117.90
GR + Max P{1}	9959			1.00	(15)	SUST	10.00	117.90
TR:Amb to T1{1}			29755	1.00	(17)	DISP	10.27	176.85
Amb to T1{1}			29755	1.00	(17)	DISP	10.27	176.85
Sus. + E1{1}	9959	2431		1.00	(16)	OCC	10.84	141.48
Sus. + E2{1}	9959	2431		1.00	(16)	OCC	10.84	141.48
Sus. + E3{1}	9959	4037		1.00	(16)	OCC	11.39	141.48
Sus. + E4{1}	9959	4037		1.00	(16)	OCC	11.39	141.48
Sus. + W1{1}	9959	2643		1.00	(16)	OCC	10.91	141.48
Sus. + W2{1}	9959	2643		1.00	(16)	OCC	10.91	141.48
Sus. + W3{1}	9959	3431		1.00	(16)	OCC	11.18	141.48
Sus. + W4{1}	9959	3431		1.00	(16)	OCC	11.18	141.48

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R E S U L T S U M M A R Y

Maximum sustained stress ratio

Point : A06 F  
Stress N/mm2 : 33.92  
Allowable N/mm2 : 117.90  
Ratio : 0.29  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A02 N  
Stress N/mm2 : 92.20  
Allowable N/mm2 : 176.85  
Ratio : 0.52  
Load combination : Max Range

Maximum occasional stress ratio

Point : A06 N  
Stress N/mm2 : 44.55  
Allowable N/mm2 : 141.48  
Ratio : 0.31  
Load combination : Sus. + W1{1}

Maximum hoop stress ratio

Point : A02 N  
Stress N/mm2 : 18.78  
Allowable N/mm2 : 117.90  
Ratio : 0.16  
Load combination : Max P{1}

## **LAMPIRAN M**

*GENERAL PIPE STRESS REPORT (OPERATING CONDITION WITH  
EXPANSION JOINT, PIPE THICKNESS = 8,501 mm)*

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A07 F-	Max P{1}					( 3) HOOP	19.66	117.90
	GR + Max P{1}	15910			8.24	(15) SUST	41.88	117.90
	TR:Amb to T1{1}			1944	8.24	(17) DISP	5.72	176.85
	Amb to T1{1}			1944	8.24	(17) DISP	5.72	176.85
	Sus. + E1{1}	15910	1236		8.24	(16) OCC	44.61	141.48
	Sus. + E2{1}	15910	1236		8.24	(16) OCC	44.61	141.48
	Sus. + E3{1}	15910	3351		8.24	(16) OCC	49.27	141.48
	Sus. + E4{1}	15910	3351		8.24	(16) OCC	49.27	141.48
	Sus. + W1{1}	15910	3227		8.24	(16) OCC	49.00	141.48
	Sus. + W2{1}	15910	3227		8.24	(16) OCC	49.00	141.48
	Sus. + W3{1}	15910	3011		8.24	(16) OCC	48.52	141.48
	Sus. + W4{1}	15910	3011		8.24	(16) OCC	48.52	141.48
A07 N+	Max P{1}					( 3) HOOP	19.66	117.90
	GR + Max P{1}	15246			8.24	(15) SUST	40.42	117.90
	TR:Amb to T1{1}			1985	8.24	(17) DISP	5.84	176.85
	Amb to T1{1}			1985	8.24	(17) DISP	5.84	176.85
	Sus. + E1{1}	15246	1453		8.24	(16) OCC	43.62	141.48
	Sus. + E2{1}	15246	1453		8.24	(16) OCC	43.62	141.48
	Sus. + E3{1}	15246	3477		8.24	(16) OCC	48.09	141.48
	Sus. + E4{1}	15246	3477		8.24	(16) OCC	48.09	141.48
	Sus. + W1{1}	15246	2333		8.24	(16) OCC	45.56	141.48
	Sus. + W2{1}	15246	2333		8.24	(16) OCC	45.56	141.48
	Sus. + W3{1}	15246	3215		8.24	(16) OCC	47.51	141.48
	Sus. + W4{1}	15246	3215		8.24	(16) OCC	47.51	141.48
A06 N+	Max P{1}					( 3) HOOP	19.66	117.90
	GR + Max P{1}	12769			8.24	(15) SUST	34.96	117.90
	TR:Amb to T1{1}			1865	8.24	(17) DISP	5.48	176.85
	Amb to T1{1}			1865	8.24	(17) DISP	5.48	176.85
	Sus. + E1{1}	12769	4814		8.24	(16) OCC	45.57	141.48
	Sus. + E2{1}	12769	4814		8.24	(16) OCC	45.57	141.48
	Sus. + E3{1}	12769	3784		8.24	(16) OCC	43.30	141.48
	Sus. + E4{1}	12769	3784		8.24	(16) OCC	43.30	141.48
	Sus. + W1{1}	12769	5229		8.24	(16) OCC	46.49	141.48
	Sus. + W2{1}	12769	5229		8.24	(16) OCC	46.49	141.48
	Sus. + W3{1}	12769	4002		8.24	(16) OCC	43.78	141.48
	Sus. + W4{1}	12769	4002		8.24	(16) OCC	43.78	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A06 F-	Max P{1}					( 3) HOOP	19.66	117.90
	GR + Max P{1}	12836			8.24	(15) SUST	35.10	117.90
	TR:Amb to T1{1}			1826	8.24	(17) DISP	5.37	176.85
	Amb to T1{1}			1826	8.24	(17) DISP	5.37	176.85
	Sus. + E1{1}	12836	4688		8.24	(16) OCC	45.44	141.48
	Sus. + E2{1}	12836	4688		8.24	(16) OCC	45.44	141.48
	Sus. + E3{1}	12836	3847		8.24	(16) OCC	43.59	141.48
	Sus. + E4{1}	12836	3847		8.24	(16) OCC	43.59	141.48
	Sus. + W1{1}	12836	5040		8.24	(16) OCC	46.22	141.48
	Sus. + W2{1}	12836	5040		8.24	(16) OCC	46.22	141.48
	Sus. + W3{1}	12836	4083		8.24	(16) OCC	44.11	141.48
	Sus. + W4{1}	12836	4083		8.24	(16) OCC	44.11	141.48
A09 F-	Max P{1}					( 3) HOOP	19.66	117.90



GR + Max P{1}	23827		4.36	(15)	SUST	34.62	117.90
TR:Amb to T1{1}			1222	4.36	(17)	DISP	1.90 176.85
Amb to T1{1}			1222	4.36	(17)	DISP	1.90 176.85
Sus. + E1{1}	23827	1675	4.36	(16)	OCC	36.58	141.48
Sus. + E2{1}	23827	1675	4.36	(16)	OCC	36.58	141.48
Sus. + E3{1}	23827	2110	4.36	(16)	OCC	37.09	141.48
Sus. + E4{1}	23827	2110	4.36	(16)	OCC	37.09	141.48
Sus. + W1{1}	23827	2401	4.36	(16)	OCC	37.43	141.48
Sus. + W2{1}	23827	2401	4.36	(16)	OCC	37.43	141.48
Sus. + W3{1}	23827	1781	4.36	(16)	OCC	36.70	141.48
Sus. + W4{1}	23827	1781	4.36	(16)	OCC	36.70	141.48
A10 + Max P{1}							
GR + Max P{1}	63398			( 3)	HOOP	19.66	117.90
TR:Amb to T1{1}			1257	1.00	(15)	SUST	29.43 117.90
Amb to T1{1}			1257	1.00	(17)	DISP	0.45 176.85
Sus. + E1{1}	63398	2035	1.00	(16)	OCC	30.16	141.48
Sus. + E2{1}	63398	2035	1.00	(16)	OCC	30.16	141.48
Sus. + E3{1}	63398	1597	1.00	(16)	OCC	30.00	141.48
Sus. + E4{1}	63398	1597	1.00	(16)	OCC	30.00	141.48
Sus. + W1{1}	63398	2235	1.00	(16)	OCC	30.23	141.48
Sus. + W2{1}	63398	2235	1.00	(16)	OCC	30.23	141.48
Sus. + W3{1}	63398	1416	1.00	(16)	OCC	29.93	141.48
Sus. + W4{1}	63398	1416	1.00	(16)	OCC	29.93	141.48
A10 - Max P{1}							
GR + Max P{1}	63398			( 3)	HOOP	19.66	117.90
TR:Amb to T1{1}			1257	1.00	(15)	SUST	29.43 117.90
Amb to T1{1}			1257	1.00	(17)	DISP	0.45 176.85
Sus. + E1{1}	63398	2035	1.00	(16)	OCC	30.16	141.48
Sus. + E2{1}	63398	2035	1.00	(16)	OCC	30.16	141.48
Sus. + E3{1}	63398	1597	1.00	(16)	OCC	30.00	141.48
Sus. + E4{1}	63398	1597	1.00	(16)	OCC	30.00	141.48
Sus. + W1{1}	63398	2235	1.00	(16)	OCC	30.23	141.48
Sus. + W2{1}	63398	2235	1.00	(16)	OCC	30.23	141.48
Sus. + W3{1}	63398	1416	1.00	(16)	OCC	29.93	141.48
Sus. + W4{1}	63398	1416	1.00	(16)	OCC	29.93	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A02 F-	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	10754			4.36	(15)	SUST	19.36	117.90
	TR:Amb to T1{1}			2203	4.36	(17)	DISP	3.43	176.85
	Amb to T1{1}			2203	4.36	(17)	DISP	3.43	176.85
	Sus. + E1{1}	10754	8495		4.36	(16)	OCC	29.28	141.48
	Sus. + E2{1}	10754	8495		4.36	(16)	OCC	29.28	141.48
	Sus. + E3{1}	10754	6231		4.36	(16)	OCC	26.63	141.48
	Sus. + E4{1}	10754	6231		4.36	(16)	OCC	26.63	141.48
	Sus. + W1{1}	10754	7387		4.36	(16)	OCC	27.98	141.48
	Sus. + W2{1}	10754	7387		4.36	(16)	OCC	27.98	141.48
	Sus. + W3{1}	10754	5153		4.36	(16)	OCC	25.37	141.48
	Sus. + W4{1}	10754	5153		4.36	(16)	OCC	25.37	141.48
A11 F-	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	11087			4.36	(15)	SUST	19.75	117.90
	TR:Amb to T1{1}			899	4.36	(17)	DISP	1.40	176.85
	Amb to T1{1}			899	4.36	(17)	DISP	1.40	176.85
	Sus. + E1{1}	11087	2613		4.36	(16)	OCC	22.80	141.48
	Sus. + E2{1}	11087	2613		4.36	(16)	OCC	22.80	141.48
	Sus. + E3{1}	11087	2809		4.36	(16)	OCC	23.03	141.48
	Sus. + E4{1}	11087	2809		4.36	(16)	OCC	23.03	141.48
	Sus. + W1{1}	11087	5802		4.36	(16)	OCC	26.52	141.48
	Sus. + W2{1}	11087	5802		4.36	(16)	OCC	26.52	141.48
	Sus. + W3{1}	11087	3589		4.36	(16)	OCC	23.94	141.48
	Sus. + W4{1}	11087	3589		4.36	(16)	OCC	23.94	141.48
A14 F-	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	5105			4.36	(15)	SUST	12.76	117.90
	TR:Amb to T1{1}			241	4.36	(17)	DISP	0.37	176.85
	Amb to T1{1}			241	4.36	(17)	DISP	0.37	176.85
	Sus. + E1{1}	5105	5905		4.36	(16)	OCC	19.65	141.48

Sus. + E2{1}	5105	5905	4.36	(16)	OCC	19.65	141.48
Sus. + E3{1}	5105	2863	4.36	(16)	OCC	16.10	141.48
Sus. + E4{1}	5105	2863	4.36	(16)	OCC	16.10	141.48
Sus. + W1{1}	5105	10342	4.36	(16)	OCC	24.84	141.48
Sus. + W2{1}	5105	10342	4.36	(16)	OCC	24.84	141.48
Sus. + W3{1}	5105	4967	4.36	(16)	OCC	18.56	141.48
Sus. + W4{1}	5105	4967	4.36	(16)	OCC	18.56	141.48

A09 N+ Max P{1}				( 3)	HOOP	19.66	117.90
GR + Max P{1}	12330			4.36	(15) SUST	21.20	117.90
TR:Amb to T1{1}			1301	4.36	(17) DISP	2.03	176.85
Amb to T1{1}			1301	4.36	(17) DISP	2.03	176.85
Sus. + E1{1}	12330	2195		4.36	(16) OCC	23.76	141.48
Sus. + E2{1}	12330	2195		4.36	(16) OCC	23.76	141.48
Sus. + E3{1}	12330	2395		4.36	(16) OCC	23.99	141.48
Sus. + E4{1}	12330	2395		4.36	(16) OCC	23.99	141.48
Sus. + W1{1}	12330	1960		4.36	(16) OCC	23.49	141.48
Sus. + W2{1}	12330	1960		4.36	(16) OCC	23.49	141.48
Sus. + W3{1}	12330	2225		4.36	(16) OCC	23.80	141.48
Sus. + W4{1}	12330	2225		4.36	(16) OCC	23.80	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			Eq. no.	Load type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )					
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F			
A05 F- Max P{1}					( 3)	HOOP	19.66	117.90
GR + Max P{1}		7266			4.36	(15) SUST	15.28	117.90
TR:Amb to T1{1}				2784	4.36	(17) DISP	4.34	176.85
Amb to T1{1}				2784	4.36	(17) DISP	4.34	176.85
Sus. + E1{1}		7266	5788		4.36	(16) OCC	22.04	141.48
Sus. + E2{1}		7266	5788		4.36	(16) OCC	22.04	141.48
Sus. + E3{1}		7266	2609		4.36	(16) OCC	18.33	141.48
Sus. + E4{1}		7266	2609		4.36	(16) OCC	18.33	141.48
Sus. + W1{1}		7266	6032		4.36	(16) OCC	22.33	141.48
Sus. + W2{1}		7266	6032		4.36	(16) OCC	22.33	141.48
Sus. + W3{1}		7266	1949		4.36	(16) OCC	17.56	141.48
Sus. + W4{1}		7266	1949		4.36	(16) OCC	17.56	141.48
A04 N+ Max P{1}					( 3)	HOOP	19.66	117.90
GR + Max P{1}		7009			4.36	(15) SUST	14.98	117.90
TR:Amb to T1{1}				2904	4.36	(17) DISP	4.52	176.85
Amb to T1{1}				2904	4.36	(17) DISP	4.52	176.85
Sus. + E1{1}		7009	5934		4.36	(16) OCC	21.91	141.48
Sus. + E2{1}		7009	5934		4.36	(16) OCC	21.91	141.48
Sus. + E3{1}		7009	3113		4.36	(16) OCC	18.62	141.48
Sus. + E4{1}		7009	3113		4.36	(16) OCC	18.62	141.48
Sus. + W1{1}		7009	6219		4.36	(16) OCC	22.24	141.48
Sus. + W2{1}		7009	6219		4.36	(16) OCC	22.24	141.48
Sus. + W3{1}		7009	2580		4.36	(16) OCC	18.00	141.48
Sus. + W4{1}		7009	2580		4.36	(16) OCC	18.00	141.48
A08 + Max P{1}					( 3)	HOOP	19.66	117.90
GR + Max P{1}		10713			1.00	(15) SUST	10.62	117.90
TR:Amb to T1{1}				1898	1.00	(17) DISP	0.68	176.85
Amb to T1{1}				1898	1.00	(17) DISP	0.68	176.85
Sus. + E1{1}		10713	20303		1.00	(16) OCC	17.87	141.48
Sus. + E2{1}		10713	20303		1.00	(16) OCC	17.87	141.48
Sus. + E3{1}		10713	14867		1.00	(16) OCC	15.93	141.48
Sus. + E4{1}		10713	14867		1.00	(16) OCC	15.93	141.48
Sus. + W1{1}		10713	31459		1.00	(16) OCC	21.85	141.48
Sus. + W2{1}		10713	31459		1.00	(16) OCC	21.85	141.48
Sus. + W3{1}		10713	17010		1.00	(16) OCC	16.69	141.48
Sus. + W4{1}		10713	17010		1.00	(16) OCC	16.69	141.48
A08 - Max P{1}					( 3)	HOOP	19.66	117.90
GR + Max P{1}		10713			1.00	(15) SUST	10.62	117.90
TR:Amb to T1{1}				1898	1.00	(17) DISP	0.68	176.85
Amb to T1{1}				1898	1.00	(17) DISP	0.68	176.85
Sus. + E1{1}		10713	20303		1.00	(16) OCC	17.87	141.48
Sus. + E2{1}		10713	20303		1.00	(16) OCC	17.87	141.48
Sus. + E3{1}		10713	14867		1.00	(16) OCC	15.93	141.48
Sus. + E4{1}		10713	14867		1.00	(16) OCC	15.93	141.48
Sus. + W1{1}		10713	31459		1.00	(16) OCC	21.85	141.48

Sus. + W2{1}	10713	31459	1.00	(16)	OCC	21.85	141.48
Sus. + W3{1}	10713	17010	1.00	(16)	OCC	16.69	141.48
Sus. + W4{1}	10713	17010	1.00	(16)	OCC	16.69	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )	(Stress in N/mm2 )	Ma (Sus.)	Mb (Occ.)			
A05 N+	Max P{1}					( 3) HOOP	19.66	117.90
	GR + Max P{1}	7352			4.36	(15) SUST	15.38	117.90
	TR:Amb to Tl{1}			2796	4.36	(17) DISP	4.35	176.85
	Amb to Tl{1}			2796	4.36	(17) DISP	4.35	176.85
	Sus. + E1{1}	7352	4634		4.36	(16) OCC	20.79	141.48
	Sus. + E2{1}	7352	4634		4.36	(16) OCC	20.79	141.48
	Sus. + E3{1}	7352	3058		4.36	(16) OCC	18.95	141.48
	Sus. + E4{1}	7352	3058		4.36	(16) OCC	18.95	141.48
	Sus. + W1{1}	7352	4514		4.36	(16) OCC	20.65	141.48
	Sus. + W2{1}	7352	4514		4.36	(16) OCC	20.65	141.48
	Sus. + W3{1}	7352	2784		4.36	(16) OCC	18.63	141.48
	Sus. + W4{1}	7352	2784		4.36	(16) OCC	18.63	141.48
A13 N+	Max P{1}					( 3) HOOP	19.66	117.90
	GR + Max P{1}	3093			4.36	(15) SUST	10.41	117.90
	TR:Amb to Tl{1}			526	4.36	(17) DISP	0.82	176.85
	Amb to Tl{1}			526	4.36	(17) DISP	0.82	176.85
	Sus. + E1{1}	3093	3691		4.36	(16) OCC	14.72	141.48
	Sus. + E2{1}	3093	3691		4.36	(16) OCC	14.72	141.48
	Sus. + E3{1}	3093	1793		4.36	(16) OCC	12.50	141.48
	Sus. + E4{1}	3093	1793		4.36	(16) OCC	12.50	141.48
	Sus. + W1{1}	3093	8003		4.36	(16) OCC	19.75	141.48
	Sus. + W2{1}	3093	8003		4.36	(16) OCC	19.75	141.48
	Sus. + W3{1}	3093	3302		4.36	(16) OCC	14.27	141.48
	Sus. + W4{1}	3093	3302		4.36	(16) OCC	14.27	141.48
A13 F-	Max P{1}					( 3) HOOP	19.66	117.90
	GR + Max P{1}	5309			4.36	(15) SUST	13.00	117.90
	TR:Amb to Tl{1}			442	4.36	(17) DISP	0.69	176.85
	Amb to Tl{1}			442	4.36	(17) DISP	0.69	176.85
	Sus. + E1{1}	5309	2939		4.36	(16) OCC	16.43	141.48
	Sus. + E2{1}	5309	2939		4.36	(16) OCC	16.43	141.48
	Sus. + E3{1}	5309	1329		4.36	(16) OCC	14.55	141.48
	Sus. + E4{1}	5309	1329		4.36	(16) OCC	14.55	141.48
	Sus. + W1{1}	5309	5732		4.36	(16) OCC	19.69	141.48
	Sus. + W2{1}	5309	5732		4.36	(16) OCC	19.69	141.48
	Sus. + W3{1}	5309	2228		4.36	(16) OCC	15.60	141.48
	Sus. + W4{1}	5309	2228		4.36	(16) OCC	15.60	141.48
A15	Max P{1}					( 3) HOOP	19.66	117.90
	GR + Max P{1}	3211			1.00	(15) SUST	7.94	117.90
	TR:Amb to Tl{1}			498	1.00	(17) DISP	0.18	176.85
	Amb to Tl{1}			498	1.00	(17) DISP	0.18	176.85
	Sus. + E1{1}	3211	11184		1.00	(16) OCC	11.94	141.48
	Sus. + E2{1}	3211	11184		1.00	(16) OCC	11.94	141.48
	Sus. + E3{1}	3211	11763		1.00	(16) OCC	12.14	141.48
	Sus. + E4{1}	3211	11763		1.00	(16) OCC	12.14	141.48
	Sus. + W1{1}	3211	23309		1.00	(16) OCC	16.26	141.48
	Sus. + W2{1}	3211	23309		1.00	(16) OCC	16.26	141.48
	Sus. + W3{1}	3211	18856		1.00	(16) OCC	14.67	141.48
	Sus. + W4{1}	3211	18856		1.00	(16) OCC	14.67	141.48

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Point	Load	ASME B31.1 (2014) CODE COMPLIANCE		CODE COMPLIANCE		Eq. Load	Code	Code
		(Moments in N.m )	(Stress in N/mm2 )	Ma	Mb			

name	combination	(Sus.)	(Occ.)	(Exp.)	S.I.F	no.	type	Stress	Allow.
A14 F+	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	5105			1.00	(15)	SUST	8.62	117.90
	TR:Amb to T1{1}			241	1.00	(17)	DISP	0.09	176.85
	Amb to T1{1}			241	1.00	(17)	DISP	0.09	176.85
	Sus. + E1{1}	5105	5905		1.00	(16)	OCC	10.73	141.48
	Sus. + E2{1}	5105	5905		1.00	(16)	OCC	10.73	141.48
	Sus. + E3{1}	5105	2863		1.00	(16)	OCC	9.64	141.48
	Sus. + E4{1}	5105	2863		1.00	(16)	OCC	9.64	141.48
	Sus. + W1{1}	5105	10342		1.00	(16)	OCC	12.31	141.48
	Sus. + W2{1}	5105	10342		1.00	(16)	OCC	12.31	141.48
	Sus. + W3{1}	5105	4967		1.00	(16)	OCC	10.39	141.48
	Sus. + W4{1}	5105	4967		1.00	(16)	OCC	10.39	141.48
A14 N+	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	1938			4.36	(15)	SUST	9.06	117.90
	TR:Amb to T1{1}			187	4.36	(17)	DISP	0.29	176.85
	Amb to T1{1}			187	4.36	(17)	DISP	0.29	176.85
	Sus. + E1{1}	1938	4671		4.36	(16)	OCC	14.52	141.48
	Sus. + E2{1}	1938	4671		4.36	(16)	OCC	14.52	141.48
	Sus. + E3{1}	1938	2181		4.36	(16)	OCC	11.61	141.48
	Sus. + E4{1}	1938	2181		4.36	(16)	OCC	11.61	141.48
	Sus. + W1{1}	1938	7345		4.36	(16)	OCC	17.64	141.48
	Sus. + W2{1}	1938	7345		4.36	(16)	OCC	17.64	141.48
	Sus. + W3{1}	1938	4014		4.36	(16)	OCC	13.75	141.48
	Sus. + W4{1}	1938	4014		4.36	(16)	OCC	13.75	141.48
A14 N-	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	1938			1.00	(15)	SUST	7.49	117.90
	TR:Amb to T1{1}			187	1.00	(17)	DISP	0.07	176.85
	Amb to T1{1}			187	1.00	(17)	DISP	0.07	176.85
	Sus. + E1{1}	1938	4671		1.00	(16)	OCC	9.16	141.48
	Sus. + E2{1}	1938	4671		1.00	(16)	OCC	9.16	141.48
	Sus. + E3{1}	1938	2181		1.00	(16)	OCC	8.27	141.48
	Sus. + E4{1}	1938	2181		1.00	(16)	OCC	8.27	141.48
	Sus. + W1{1}	1938	7345		1.00	(16)	OCC	10.11	141.48
	Sus. + W2{1}	1938	7345		1.00	(16)	OCC	10.11	141.48
	Sus. + W3{1}	1938	4014		1.00	(16)	OCC	8.92	141.48
	Sus. + W4{1}	1938	4014		1.00	(16)	OCC	8.92	141.48
A13 F+	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	5309			1.00	(15)	SUST	8.69	117.90
	TR:Amb to T1{1}			442	1.00	(17)	DISP	0.16	176.85
	Amb to T1{1}			442	1.00	(17)	DISP	0.16	176.85
	Sus. + E1{1}	5309	2939		1.00	(16)	OCC	9.74	141.48
	Sus. + E2{1}	5309	2939		1.00	(16)	OCC	9.74	141.48
	Sus. + E3{1}	5309	1329		1.00	(16)	OCC	9.17	141.48
	Sus. + E4{1}	5309	1329		1.00	(16)	OCC	9.17	141.48
	Sus. + W1{1}	5309	5732		1.00	(16)	OCC	10.74	141.48
	Sus. + W2{1}	5309	5732		1.00	(16)	OCC	10.74	141.48
	Sus. + W3{1}	5309	2228		1.00	(16)	OCC	9.49	141.48
	Sus. + W4{1}	5309	2228		1.00	(16)	OCC	9.49	141.48

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ASME B31.1 (2014) CODE COMPLIANCE										
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.	
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type			
A13 N-	Max P{1}						( 3)	HOOP	19.66	117.90
	GR + Max P{1}	3093			1.00	(15)	SUST	7.90	117.90	
	TR:Amb to T1{1}			526	1.00	(17)	DISP	0.19	176.85	
	Amb to T1{1}			526	1.00	(17)	DISP	0.19	176.85	
	Sus. + E1{1}	3093	3691		1.00	(16)	OCC	9.22	141.48	
	Sus. + E2{1}	3093	3691		1.00	(16)	OCC	9.22	141.48	
	Sus. + E3{1}	3093	1793		1.00	(16)	OCC	8.54	141.48	
	Sus. + E4{1}	3093	1793		1.00	(16)	OCC	8.54	141.48	
	Sus. + W1{1}	3093	8003		1.00	(16)	OCC	10.76	141.48	
	Sus. + W2{1}	3093	8003		1.00	(16)	OCC	10.76	141.48	
	Sus. + W3{1}	3093	3302		1.00	(16)	OCC	9.08	141.48	
	Sus. + W4{1}	3093	3302		1.00	(16)	OCC	9.08	141.48	
A12 +	Max P{1}						( 3)	HOOP	19.66	117.90
	GR + Max P{1}	11391			1.00	(15)	SUST	10.86	117.90	

TR:Amb to T1{1}			909	1.00	(17)	DISP	0.32	176.85
Amb to T1{1}			909	1.00	(17)	DISP	0.32	176.85
Sus. + E1{1}	11391	2788		1.00	(16)	OCC	11.86	141.48
Sus. + E2{1}	11391	2788		1.00	(16)	OCC	11.86	141.48
Sus. + E3{1}	11391	3026		1.00	(16)	OCC	11.94	141.48
Sus. + E4{1}	11391	3026		1.00	(16)	OCC	11.94	141.48
Sus. + W1{1}	11391	6000		1.00	(16)	OCC	13.01	141.48
Sus. + W2{1}	11391	6000		1.00	(16)	OCC	13.01	141.48
Sus. + W3{1}	11391	3772		1.00	(16)	OCC	12.21	141.48
Sus. + W4{1}	11391	3772		1.00	(16)	OCC	12.21	141.48
A12 - Max P{1}								
GR + Max P{1}	11391			1.00	(15)	SUST	10.86	117.90
TR:Amb to T1{1}			909	1.00	(17)	DISP	0.32	176.85
Amb to T1{1}			909	1.00	(17)	DISP	0.32	176.85
Sus. + E1{1}	11391	2788		1.00	(16)	OCC	11.86	141.48
Sus. + E2{1}	11391	2788		1.00	(16)	OCC	11.86	141.48
Sus. + E3{1}	11391	3026		1.00	(16)	OCC	11.94	141.48
Sus. + E4{1}	11391	3026		1.00	(16)	OCC	11.94	141.48
Sus. + W1{1}	11391	6000		1.00	(16)	OCC	13.01	141.48
Sus. + W2{1}	11391	6000		1.00	(16)	OCC	13.01	141.48
Sus. + W3{1}	11391	3772		1.00	(16)	OCC	12.21	141.48
Sus. + W4{1}	11391	3772		1.00	(16)	OCC	12.21	141.48
All F+ Max P{1}								
GR + Max P{1}	11087			1.00	(15)	SUST	10.76	117.90
TR:Amb to T1{1}			899	1.00	(17)	DISP	0.32	176.85
Amb to T1{1}			899	1.00	(17)	DISP	0.32	176.85
Sus. + E1{1}	11087	2613		1.00	(16)	OCC	11.69	141.48
Sus. + E2{1}	11087	2613		1.00	(16)	OCC	11.69	141.48
Sus. + E3{1}	11087	2809		1.00	(16)	OCC	11.76	141.48
Sus. + E4{1}	11087	2809		1.00	(16)	OCC	11.76	141.48
Sus. + W1{1}	11087	5802		1.00	(16)	OCC	12.83	141.48
Sus. + W2{1}	11087	5802		1.00	(16)	OCC	12.83	141.48
Sus. + W3{1}	11087	3589		1.00	(16)	OCC	12.04	141.48
Sus. + W4{1}	11087	3589		1.00	(16)	OCC	12.04	141.48

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ASME B31.1 (2014) CODE COMPLIANCE								
(Moments in N.m )			(Stress in N/mm2 )					
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress	Code Allow.
-----								
All N+	Max P{1}					( 3) HOOP	19.66	117.90
	GR + Max P{1}	7603			4.36	(15) SUST	15.68	117.90
	TR:Amb to T1{1}			940	4.36	(17) DISP	1.46	176.85
	Amb to T1{1}			940	4.36	(17) DISP	1.46	176.85
	Sus. + E1{1}	7603	1110		4.36	(16) OCC	16.97	141.48
	Sus. + E2{1}	7603	1110		4.36	(16) OCC	16.97	141.48
	Sus. + E3{1}	7603	931		4.36	(16) OCC	16.76	141.48
	Sus. + E4{1}	7603	931		4.36	(16) OCC	16.76	141.48
	Sus. + W1{1}	7603	2378		4.36	(16) OCC	18.45	141.48
	Sus. + W2{1}	7603	2378		4.36	(16) OCC	18.45	141.48
	Sus. + W3{1}	7603	1694		4.36	(16) OCC	17.66	141.48
	Sus. + W4{1}	7603	1694		4.36	(16) OCC	17.66	141.48
-----								
All N-	Max P{1}					( 3) HOOP	19.66	117.90
	GR + Max P{1}	7603			1.00	(15) SUST	9.51	117.90
	TR:Amb to T1{1}			940	1.00	(17) DISP	0.34	176.85
	Amb to T1{1}			940	1.00	(17) DISP	0.34	176.85
	Sus. + E1{1}	7603	1110		1.00	(16) OCC	9.91	141.48
	Sus. + E2{1}	7603	1110		1.00	(16) OCC	9.91	141.48
	Sus. + E3{1}	7603	931		1.00	(16) OCC	9.84	141.48
	Sus. + E4{1}	7603	931		1.00	(16) OCC	9.84	141.48
	Sus. + W1{1}	7603	2378		1.00	(16) OCC	10.36	141.48
	Sus. + W2{1}	7603	2378		1.00	(16) OCC	10.36	141.48
	Sus. + W3{1}	7603	1694		1.00	(16) OCC	10.12	141.48
	Sus. + W4{1}	7603	1694		1.00	(16) OCC	10.12	141.48
-----								
A09 F+	Max P{1}					( 3) HOOP	19.66	117.90
	GR + Max P{1}	23827			1.00	(15) SUST	15.30	117.90
	TR:Amb to T1{1}			1222	1.00	(17) DISP	0.44	176.85
	Amb to T1{1}			1222	1.00	(17) DISP	0.44	176.85
	Sus. + E1{1}	23827	1675		1.00	(16) OCC	15.90	141.48
	Sus. + E2{1}	23827	1675		1.00	(16) OCC	15.90	141.48

Sus. + E3{1}	23827	2110	1.00	(16)	OCC	16.06	141.48
Sus. + E4{1}	23827	2110	1.00	(16)	OCC	16.06	141.48
Sus. + W1{1}	23827	2401	1.00	(16)	OCC	16.16	141.48
Sus. + W2{1}	23827	2401	1.00	(16)	OCC	16.16	141.48
Sus. + W3{1}	23827	1781	1.00	(16)	OCC	15.94	141.48
Sus. + W4{1}	23827	1781	1.00	(16)	OCC	15.94	141.48
-----							
A09 N- Max P{1}				( 3)	HOOP	19.66	117.90
GR + Max P{1}	12330		1.00	(15)	SUST	11.20	117.90
TR:Amb to T1{1}			1301	1.00	(17)	DISP	0.46 176.85
Amb to T1{1}			1301	1.00	(17)	DISP	0.46 176.85
Sus. + E1{1}	12330	2195	1.00	(16)	OCC	11.98	141.48
Sus. + E2{1}	12330	2195	1.00	(16)	OCC	11.98	141.48
Sus. + E3{1}	12330	2395	1.00	(16)	OCC	12.05	141.48
Sus. + E4{1}	12330	2395	1.00	(16)	OCC	12.05	141.48
Sus. + W1{1}	12330	1960	1.00	(16)	OCC	11.90	141.48
Sus. + W2{1}	12330	1960	1.00	(16)	OCC	11.90	141.48
Sus. + W3{1}	12330	2225	1.00	(16)	OCC	11.99	141.48
Sus. + W4{1}	12330	2225	1.00	(16)	OCC	11.99	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F			
-----								
A07 F+ Max P{1}						( 3) HOOP	19.66	117.90
GR + Max P{1}		15910			1.00	(15) SUST	12.48	117.90
TR:Amb to T1{1}				1944	1.00	(17) DISP	0.69	176.85
Amb to T1{1}				1944	1.00	(17) DISP	0.69	176.85
Sus. + E1{1}		15910	1236		1.00	(16) OCC	12.92	141.48
Sus. + E2{1}		15910	1236		1.00	(16) OCC	12.92	141.48
Sus. + E3{1}		15910	3351		1.00	(16) OCC	13.67	141.48
Sus. + E4{1}		15910	3351		1.00	(16) OCC	13.67	141.48
Sus. + W1{1}		15910	3227		1.00	(16) OCC	13.63	141.48
Sus. + W2{1}		15910	3227		1.00	(16) OCC	13.63	141.48
Sus. + W3{1}		15910	3011		1.00	(16) OCC	13.55	141.48
Sus. + W4{1}		15910	3011		1.00	(16) OCC	13.55	141.48
-----								
A07 N- Max P{1}						( 3) HOOP	19.66	117.90
GR + Max P{1}		15246			1.00	(15) SUST	12.24	117.90
TR:Amb to T1{1}				1985	1.00	(17) DISP	0.71	176.85
Amb to T1{1}				1985	1.00	(17) DISP	0.71	176.85
Sus. + E1{1}		15246	1453		1.00	(16) OCC	12.76	141.48
Sus. + E2{1}		15246	1453		1.00	(16) OCC	12.76	141.48
Sus. + E3{1}		15246	3477		1.00	(16) OCC	13.48	141.48
Sus. + E4{1}		15246	3477		1.00	(16) OCC	13.48	141.48
Sus. + W1{1}		15246	2333		1.00	(16) OCC	13.07	141.48
Sus. + W2{1}		15246	2333		1.00	(16) OCC	13.07	141.48
Sus. + W3{1}		15246	3215		1.00	(16) OCC	13.39	141.48
Sus. + W4{1}		15246	3215		1.00	(16) OCC	13.39	141.48
-----								
A06 F+ Max P{1}						( 3) HOOP	19.66	117.90
GR + Max P{1}		12836			1.00	(15) SUST	11.38	117.90
TR:Amb to T1{1}				1826	1.00	(17) DISP	0.65	176.85
Amb to T1{1}				1826	1.00	(17) DISP	0.65	176.85
Sus. + E1{1}		12836	4688		1.00	(16) OCC	13.05	141.48
Sus. + E2{1}		12836	4688		1.00	(16) OCC	13.05	141.48
Sus. + E3{1}		12836	3847		1.00	(16) OCC	12.75	141.48
Sus. + E4{1}		12836	3847		1.00	(16) OCC	12.75	141.48
Sus. + W1{1}		12836	5040		1.00	(16) OCC	13.18	141.48
Sus. + W2{1}		12836	5040		1.00	(16) OCC	13.18	141.48
Sus. + W3{1}		12836	4083		1.00	(16) OCC	12.84	141.48
Sus. + W4{1}		12836	4083		1.00	(16) OCC	12.84	141.48
-----								
A06 N- Max P{1}						( 3) HOOP	19.66	117.90
GR + Max P{1}		12769			1.00	(15) SUST	11.36	117.90
TR:Amb to T1{1}				1865	1.00	(17) DISP	0.67	176.85
Amb to T1{1}				1865	1.00	(17) DISP	0.67	176.85
Sus. + E1{1}		12769	4814		1.00	(16) OCC	13.07	141.48
Sus. + E2{1}		12769	4814		1.00	(16) OCC	13.07	141.48
Sus. + E3{1}		12769	3784		1.00	(16) OCC	12.71	141.48
Sus. + E4{1}		12769	3784		1.00	(16) OCC	12.71	141.48
Sus. + W1{1}		12769	5229		1.00	(16) OCC	13.22	141.48
Sus. + W2{1}		12769	5229		1.00	(16) OCC	13.22	141.48

Sus. + W3{1}	12769	4002	1.00	(16)	OCC	12.78	141.48
Sus. + W4{1}	12769	4002	1.00	(16)	OCC	12.78	141.48

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		ASME B31.1 (2014)		CODE COMPLIANCE			
		(Moments in N.m )		(Stress in N/mm2 )			
Point	Load	Ma	Mb	Mc	Eq. Load	Code	Code
name	combination	(Sus.)	(Occ.)	(Exp.)	no. type	Stress	Allow.
A05 F+	Max P{1}				( 3) HOOP	19.66	117.90
	GR + Max P{1}	7266			(15) SUST	9.39	117.90
	TR:Amb to T1{1}			2784	(17) DISP	0.99	176.85
	Amb to T1{1}			2784	(17) DISP	0.99	176.85
	Sus. + E1{1}	7266	5788		(16) OCC	11.46	141.48
	Sus. + E2{1}	7266	5788		(16) OCC	11.46	141.48
	Sus. + E3{1}	7266	2609		(16) OCC	10.32	141.48
	Sus. + E4{1}	7266	2609		(16) OCC	10.32	141.48
	Sus. + W1{1}	7266	6032		(16) OCC	11.54	141.48
	Sus. + W2{1}	7266	6032		(16) OCC	11.54	141.48
	Sus. + W3{1}	7266	1949		(16) OCC	10.09	141.48
	Sus. + W4{1}	7266	1949		(16) OCC	10.09	141.48
A05 N-	Max P{1}				( 3) HOOP	19.66	117.90
	GR + Max P{1}	7352			(15) SUST	9.42	117.90
	TR:Amb to T1{1}			2796	(17) DISP	1.00	176.85
	Amb to T1{1}			2796	(17) DISP	1.00	176.85
	Sus. + E1{1}	7352	4634		(16) OCC	11.08	141.48
	Sus. + E2{1}	7352	4634		(16) OCC	11.08	141.48
	Sus. + E3{1}	7352	3058		(16) OCC	10.51	141.48
	Sus. + E4{1}	7352	3058		(16) OCC	10.51	141.48
	Sus. + W1{1}	7352	4514		(16) OCC	11.03	141.48
	Sus. + W2{1}	7352	4514		(16) OCC	11.03	141.48
	Sus. + W3{1}	7352	2784		(16) OCC	10.42	141.48
	Sus. + W4{1}	7352	2784		(16) OCC	10.42	141.48
A04 F+	Max P{1}				( 3) HOOP	19.66	117.90
	GR + Max P{1}	6768			(15) SUST	9.21	117.90
	TR:Amb to T1{1}			2317	(17) DISP	0.83	176.85
	Amb to T1{1}			2317	(17) DISP	0.83	176.85
	Sus. + E1{1}	6768	3750		(16) OCC	10.55	141.48
	Sus. + E2{1}	6768	3750		(16) OCC	10.55	141.48
	Sus. + E3{1}	6768	3943		(16) OCC	10.62	141.48
	Sus. + E4{1}	6768	3943		(16) OCC	10.62	141.48
	Sus. + W1{1}	6768	3555		(16) OCC	10.48	141.48
	Sus. + W2{1}	6768	3555		(16) OCC	10.48	141.48
	Sus. + W3{1}	6768	3382		(16) OCC	10.42	141.48
	Sus. + W4{1}	6768	3382		(16) OCC	10.42	141.48
A04 F-	Max P{1}				( 3) HOOP	19.66	117.90
	GR + Max P{1}	6768			(15) SUST	14.70	117.90
	TR:Amb to T1{1}			2317	(17) DISP	3.61	176.85
	Amb to T1{1}			2317	(17) DISP	3.61	176.85
	Sus. + E1{1}	6768	3750		(16) OCC	19.08	141.48
	Sus. + E2{1}	6768	3750		(16) OCC	19.08	141.48
	Sus. + E3{1}	6768	3943		(16) OCC	19.31	141.48
	Sus. + E4{1}	6768	3943		(16) OCC	19.31	141.48
	Sus. + W1{1}	6768	3555		(16) OCC	18.85	141.48
	Sus. + W2{1}	6768	3555		(16) OCC	18.85	141.48
	Sus. + W3{1}	6768	3382		(16) OCC	18.65	141.48
	Sus. + W4{1}	6768	3382		(16) OCC	18.65	141.48

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		ASME B31.1 (2014)		CODE COMPLIANCE			
		(Moments in N.m )		(Stress in N/mm2 )			
Point	Load	Ma	Mb	Mc	Eq. Load	Code	Code
name	combination	(Sus.)	(Occ.)	(Exp.)	no. type	Stress	Allow.

-----									
A04 N-	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	7009				1.00	(15) SUST	9.30	117.90
	TR:Amb to T1{1}			2904		1.00	(17) DISP	1.04	176.85
	Amb to T1{1}			2904		1.00	(17) DISP	1.04	176.85
	Sus. + E1{1}	7009	5934			1.00	(16) OCC	11.42	141.48
	Sus. + E2{1}	7009	5934			1.00	(16) OCC	11.42	141.48
	Sus. + E3{1}	7009	3113			1.00	(16) OCC	10.41	141.48
	Sus. + E4{1}	7009	3113			1.00	(16) OCC	10.41	141.48
	Sus. + W1{1}	7009	6219			1.00	(16) OCC	11.52	141.48
	Sus. + W2{1}	7009	6219			1.00	(16) OCC	11.52	141.48
	Sus. + W3{1}	7009	2580			1.00	(16) OCC	10.22	141.48
	Sus. + W4{1}	7009	2580			1.00	(16) OCC	10.22	141.48
A03 +	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	18762				1.00	(15) SUST	13.49	117.90
	TR:Amb to T1{1}			4274		1.00	(17) DISP	1.53	176.85
	Amb to T1{1}			4274		1.00	(17) DISP	1.53	176.85
	Sus. + E1{1}	18762	8012			1.00	(16) OCC	16.35	141.48
	Sus. + E2{1}	18762	8012			1.00	(16) OCC	16.35	141.48
	Sus. + E3{1}	18762	9353			1.00	(16) OCC	16.83	141.48
	Sus. + E4{1}	18762	9353			1.00	(16) OCC	16.83	141.48
	Sus. + W1{1}	18762	7383			1.00	(16) OCC	16.13	141.48
	Sus. + W2{1}	18762	7383			1.00	(16) OCC	16.13	141.48
	Sus. + W3{1}	18762	8386			1.00	(16) OCC	16.49	141.48
	Sus. + W4{1}	18762	8386			1.00	(16) OCC	16.49	141.48
A03 -	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	18762				1.00	(15) SUST	13.49	117.90
	TR:Amb to T1{1}			4274		1.00	(17) DISP	1.53	176.85
	Amb to T1{1}			4274		1.00	(17) DISP	1.53	176.85
	Sus. + E1{1}	18762	8012			1.00	(16) OCC	16.35	141.48
	Sus. + E2{1}	18762	8012			1.00	(16) OCC	16.35	141.48
	Sus. + E3{1}	18762	9353			1.00	(16) OCC	16.83	141.48
	Sus. + E4{1}	18762	9353			1.00	(16) OCC	16.83	141.48
	Sus. + W1{1}	18762	7383			1.00	(16) OCC	16.13	141.48
	Sus. + W2{1}	18762	7383			1.00	(16) OCC	16.13	141.48
	Sus. + W3{1}	18762	8386			1.00	(16) OCC	16.49	141.48
	Sus. + W4{1}	18762	8386			1.00	(16) OCC	16.49	141.48
A02 F+	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	10754				1.00	(15) SUST	10.64	117.90
	TR:Amb to T1{1}			2203		1.00	(17) DISP	0.79	176.85
	Amb to T1{1}			2203		1.00	(17) DISP	0.79	176.85
	Sus. + E1{1}	10754	8495			1.00	(16) OCC	13.67	141.48
	Sus. + E2{1}	10754	8495			1.00	(16) OCC	13.67	141.48
	Sus. + E3{1}	10754	6231			1.00	(16) OCC	12.86	141.48
	Sus. + E4{1}	10754	6231			1.00	(16) OCC	12.86	141.48
	Sus. + W1{1}	10754	7387			1.00	(16) OCC	13.27	141.48
	Sus. + W2{1}	10754	7387			1.00	(16) OCC	13.27	141.48
	Sus. + W3{1}	10754	5153			1.00	(16) OCC	12.48	141.48
	Sus. + W4{1}	10754	5153			1.00	(16) OCC	12.48	141.48

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-----									
ASME B31.1 (2014) CODE COMPLIANCE									
(Moments in N.m ) (Stress in N/mm2 )									
Point	Load	Ma	Mb	Mc	S.I.F	Eq. Load	Code	Code	
name	combination	(Sus.)	(Occ.)	(Exp.)		no. type	Stress	Allow.	
-----									
A02 N+	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	4868				4.36	(15) SUST	12.48	117.90
	TR:Amb to T1{1}			1842		4.36	(17) DISP	2.87	176.85
	Amb to T1{1}			1842		4.36	(17) DISP	2.87	176.85
	Sus. + E1{1}	4868	4638			4.36	(16) OCC	17.90	141.48
	Sus. + E2{1}	4868	4638			4.36	(16) OCC	17.90	141.48
	Sus. + E3{1}	4868	3747			4.36	(16) OCC	16.86	141.48
	Sus. + E4{1}	4868	3747			4.36	(16) OCC	16.86	141.48
	Sus. + W1{1}	4868	3781			4.36	(16) OCC	16.90	141.48
	Sus. + W2{1}	4868	3781			4.36	(16) OCC	16.90	141.48
	Sus. + W3{1}	4868	2828			4.36	(16) OCC	15.79	141.48
	Sus. + W4{1}	4868	2828			4.36	(16) OCC	15.79	141.48
A02 N-	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	4868				1.00	(15) SUST	8.54	117.90
	TR:Amb to T1{1}			1842		1.00	(17) DISP	0.66	176.85



	Amb to T1{1}			1842	1.00	(17)	DISP	0.66	176.85
	Sus. + E1{1}	4868	4638		1.00	(16)	OCC	10.19	141.48
	Sus. + E2{1}	4868	4638		1.00	(16)	OCC	10.19	141.48
	Sus. + E3{1}	4868	3747		1.00	(16)	OCC	9.87	141.48
	Sus. + E4{1}	4868	3747		1.00	(16)	OCC	9.87	141.48
	Sus. + W1{1}	4868	3781		1.00	(16)	OCC	9.88	141.48
	Sus. + W2{1}	4868	3781		1.00	(16)	OCC	9.88	141.48
	Sus. + W3{1}	4868	2828		1.00	(16)	OCC	9.54	141.48
	Sus. + W4{1}	4868	2828		1.00	(16)	OCC	9.54	141.48
A01	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	3989			1.00	(15)	SUST	8.22	117.90
	TR:Amb to T1{1}			1822	1.00	(17)	DISP	0.65	176.85
	Amb to T1{1}			1822	1.00	(17)	DISP	0.65	176.85
	Sus. + E1{1}	3989	2050		1.00	(16)	OCC	8.95	141.48
	Sus. + E2{1}	3989	2050		1.00	(16)	OCC	8.95	141.48
	Sus. + E3{1}	3989	3559		1.00	(16)	OCC	9.49	141.48
	Sus. + E4{1}	3989	3559		1.00	(16)	OCC	9.49	141.48
	Sus. + W1{1}	3989	1153		1.00	(16)	OCC	8.63	141.48
	Sus. + W2{1}	3989	1153		1.00	(16)	OCC	8.63	141.48
	Sus. + W3{1}	3989	2676		1.00	(16)	OCC	9.18	141.48
	Sus. + W4{1}	3989	2676		1.00	(16)	OCC	9.18	141.48

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R E S U L T     S U M M A R Y  
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Maximum sustained stress ratio

Point            : A07 F  
Stress     N/mm2 : 41.88  
Allowable N/mm2 : 117.90  
Ratio         : 0.36  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point            : A07 N  
Stress     N/mm2 : 5.84  
Allowable N/mm2 : 176.85  
Ratio         : 0.03  
Load combination : Max Range

Maximum occasional stress ratio

Point            : A07 F  
Stress     N/mm2 : 49.27  
Allowable N/mm2 : 141.48  
Ratio         : 0.35  
Load combination : Sus. + E3{1}

Maximum hoop stress ratio

Point            : A07 F  
Stress     N/mm2 : 19.66  
Allowable N/mm2 : 117.90  
Ratio         : 0.17  
Load combination : Max P{1}

## **LAMPIRAN N**

*GENERAL PIPE STRESS REPORT (OPERATING CONDITION  
WITHOUT EXPANSION JOINT, PIPE THICKNESS = 8,501 mm)*

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A02 N+	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	7041			4.36		(15) SUST	15.02	117.90
	TR:Amb to T1{1}			58542	4.36		(17) DISP	91.16	176.85
	Amb to T1{1}			58542	4.36		(17) DISP	91.16	176.85
	Sus. + E1{1}	7041	3062		4.36		(16) OCC	18.60	141.48
	Sus. + E2{1}	7041	3062		4.36		(16) OCC	18.60	141.48
	Sus. + E3{1}	7041	3780		4.36		(16) OCC	19.43	141.48
	Sus. + E4{1}	7041	3780		4.36		(16) OCC	19.43	141.48
	Sus. + W1{1}	7041	3023		4.36		(16) OCC	18.55	141.48
	Sus. + W2{1}	7041	3023		4.36		(16) OCC	18.55	141.48
	Sus. + W3{1}	7041	3240		4.36		(16) OCC	18.80	141.48
	Sus. + W4{1}	7041	3240		4.36		(16) OCC	18.80	141.48
A04 N+	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	9219			4.36		(15) SUST	17.56	117.90
	TR:Amb to T1{1}			33744	4.36		(17) DISP	52.54	176.85
	Amb to T1{1}			33744	4.36		(17) DISP	52.54	176.85
	Sus. + E1{1}	9219	5267		4.36		(16) OCC	23.71	141.48
	Sus. + E2{1}	9219	5267		4.36		(16) OCC	23.71	141.48
	Sus. + E3{1}	9219	2497		4.36		(16) OCC	20.48	141.48
	Sus. + E4{1}	9219	2497		4.36		(16) OCC	20.48	141.48
	Sus. + W1{1}	9219	6470		4.36		(16) OCC	25.12	141.48
	Sus. + W2{1}	9219	6470		4.36		(16) OCC	25.12	141.48
	Sus. + W3{1}	9219	2029		4.36		(16) OCC	19.93	141.48
	Sus. + W4{1}	9219	2029		4.36		(16) OCC	19.93	141.48
A07 N+	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	11028			8.24		(15) SUST	31.12	117.90
	TR:Amb to T1{1}			17112	8.24		(17) DISP	50.31	176.85
	Amb to T1{1}			17112	8.24		(17) DISP	50.31	176.85
	Sus. + E1{1}	11028	1507		8.24		(16) OCC	34.44	141.48
	Sus. + E2{1}	11028	1507		8.24		(16) OCC	34.44	141.48
	Sus. + E3{1}	11028	2343		8.24		(16) OCC	36.29	141.48
	Sus. + E4{1}	11028	2343		8.24		(16) OCC	36.29	141.48
	Sus. + W1{1}	11028	2440		8.24		(16) OCC	36.50	141.48
	Sus. + W2{1}	11028	2440		8.24		(16) OCC	36.50	141.48
	Sus. + W3{1}	11028	2537		8.24		(16) OCC	36.71	141.48
	Sus. + W4{1}	11028	2537		8.24		(16) OCC	36.71	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A07 F-	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	11746			8.24		(15) SUST	32.70	117.90
	TR:Amb to T1{1}			16598	8.24		(17) DISP	48.80	176.85
	Amb to T1{1}			16598	8.24		(17) DISP	48.80	176.85
	Sus. + E1{1}	11746	1615		8.24		(16) OCC	36.26	141.48
	Sus. + E2{1}	11746	1615		8.24		(16) OCC	36.26	141.48
	Sus. + E3{1}	11746	2071		8.24		(16) OCC	37.27	141.48
	Sus. + E4{1}	11746	2071		8.24		(16) OCC	37.27	141.48
	Sus. + W1{1}	11746	3226		8.24		(16) OCC	39.81	141.48
	Sus. + W2{1}	11746	3226		8.24		(16) OCC	39.81	141.48
	Sus. + W3{1}	11746	2234		8.24		(16) OCC	37.63	141.48
	Sus. + W4{1}	11746	2234		8.24		(16) OCC	37.63	141.48
A06 N+	Max P{1}						( 3) HOOP	19.66	117.90

GR + Max P{1}	12628		8.24	(15)	SUST	34.65	117.90
TR:Amb to T1{1}			12212	8.24	(17)	DISP	35.91 176.85
Amb to T1{1}			12212	8.24	(17)	DISP	35.91 176.85
Sus. + E1{1}	12628	4289	8.24	(16)	OCC	44.10	141.48
Sus. + E2{1}	12628	4289	8.24	(16)	OCC	44.10	141.48
Sus. + E3{1}	12628	3310	8.24	(16)	OCC	41.95	141.48
Sus. + E4{1}	12628	3310	8.24	(16)	OCC	41.95	141.48
Sus. + W1{1}	12628	5167	8.24	(16)	OCC	46.04	141.48
Sus. + W2{1}	12628	5167	8.24	(16)	OCC	46.04	141.48
Sus. + W3{1}	12628	3984	8.24	(16)	OCC	43.43	141.48
Sus. + W4{1}	12628	3984	8.24	(16)	OCC	43.43	141.48
A06 F- Max P{1}							
GR + Max P{1}	12702			( 3)	HOOP	19.66	117.90
TR:Amb to T1{1}			12011	8.24	(15)	SUST	34.81 117.90
Amb to T1{1}			12011	8.24	(17)	DISP	35.32 176.85
Sus. + E1{1}	12702	4278	8.24	(16)	OCC	44.24	141.48
Sus. + E2{1}	12702	4278	8.24	(16)	OCC	44.24	141.48
Sus. + E3{1}	12702	3437	8.24	(16)	OCC	42.39	141.48
Sus. + E4{1}	12702	3437	8.24	(16)	OCC	42.39	141.48
Sus. + W1{1}	12702	5076	8.24	(16)	OCC	46.00	141.48
Sus. + W2{1}	12702	5076	8.24	(16)	OCC	46.00	141.48
Sus. + W3{1}	12702	4114	8.24	(16)	OCC	43.88	141.48
Sus. + W4{1}	12702	4114	8.24	(16)	OCC	43.88	141.48
A02 F- Max P{1}							
GR + Max P{1}	9690			( 3)	HOOP	19.66	117.90
TR:Amb to T1{1}			28105	4.36	(15)	SUST	18.11 117.90
Amb to T1{1}			28105	4.36	(17)	DISP	43.76 176.85
Sus. + E1{1}	9690	2346	4.36	(16)	OCC	20.85	141.48
Sus. + E2{1}	9690	2346	4.36	(16)	OCC	20.85	141.48
Sus. + E3{1}	9690	3905	4.36	(16)	OCC	22.67	141.48
Sus. + E4{1}	9690	3905	4.36	(16)	OCC	22.67	141.48
Sus. + W1{1}	9690	2624	4.36	(16)	OCC	21.18	141.48
Sus. + W2{1}	9690	2624	4.36	(16)	OCC	21.18	141.48
Sus. + W3{1}	9690	3415	4.36	(16)	OCC	22.10	141.48
Sus. + W4{1}	9690	3415	4.36	(16)	OCC	22.10	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	Moments in N.m			Stress in N/mm2			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A05 F- Max P{1}									
GR + Max P{1}		4258				( 3)	HOOP	19.66	117.90
TR:Amb to T1{1}				24947	4.36	(15)	SUST	11.77	117.90
Amb to T1{1}				24947	4.36	(17)	DISP	38.85	176.85
Sus. + E1{1}		4258	3932		4.36	(17)	DISP	38.85	176.85
Sus. + E2{1}		4258	3932		4.36	(16)	OCC	16.36	141.48
Sus. + E3{1}		4258	940		4.36	(16)	OCC	16.36	141.48
Sus. + E4{1}		4258	940		4.36	(16)	OCC	12.87	141.48
Sus. + W1{1}		4258	4912		4.36	(16)	OCC	12.87	141.48
Sus. + W2{1}		4258	4912		4.36	(16)	OCC	17.51	141.48
Sus. + W3{1}		4258	896		4.36	(16)	OCC	17.51	141.48
Sus. + W4{1}		4258	896		4.36	(16)	OCC	12.82	141.48
A05 N+ Max P{1}									
GR + Max P{1}		3219				( 3)	HOOP	19.66	117.90
TR:Amb to T1{1}				23356	4.36	(15)	SUST	10.56	117.90
Amb to T1{1}				23356	4.36	(17)	DISP	36.37	176.85
Sus. + E1{1}		3219	2609		4.36	(17)	DISP	36.37	176.85
Sus. + E2{1}		3219	2609		4.36	(16)	OCC	13.60	141.48
Sus. + E3{1}		3219	2043		4.36	(16)	OCC	13.60	141.48
Sus. + E4{1}		3219	2043		4.36	(16)	OCC	12.94	141.48
Sus. + W1{1}		3219	3167		4.36	(16)	OCC	12.94	141.48
Sus. + W2{1}		3219	3167		4.36	(16)	OCC	14.26	141.48
Sus. + W3{1}		3219	2448		4.36	(16)	OCC	14.26	141.48
Sus. + W4{1}		3219	2448		4.36	(16)	OCC	13.41	141.48
A09 F- Max P{1}									
GR + Max P{1}		21779				( 3)	HOOP	19.66	117.90
TR:Amb to T1{1}				7271	4.36	(15)	SUST	32.23	117.90
Amb to T1{1}				7271	4.36	(17)	DISP	11.32	176.85
Sus. + E1{1}		21779	641		4.36	(17)	DISP	11.32	176.85
					4.36	(16)	OCC	32.98	141.48

Sus. + E2{1}	21779	641	4.36	(16)	OCC	32.98	141.48
Sus. + E3{1}	21779	992	4.36	(16)	OCC	33.39	141.48
Sus. + E4{1}	21779	992	4.36	(16)	OCC	33.39	141.48
Sus. + W1{1}	21779	1996	4.36	(16)	OCC	34.56	141.48
Sus. + W2{1}	21779	1996	4.36	(16)	OCC	34.56	141.48
Sus. + W3{1}	21779	1042	4.36	(16)	OCC	33.45	141.48
Sus. + W4{1}	21779	1042	4.36	(16)	OCC	33.45	141.48

A04 F- Max P{1}				( 3)	HOOP	19.66	117.90	
GR + Max P{1}	4122		4.36	(15)	SUST	11.61	117.90	
TR:Amb to T1{1}			19634	4.36	(17)	DISP	30.57	176.85
Amb to T1{1}			19634	4.36	(17)	DISP	30.57	176.85
Sus. + E1{1}	4122	2868	4.36	(16)	OCC	14.96	141.48	
Sus. + E2{1}	4122	2868	4.36	(16)	OCC	14.96	141.48	
Sus. + E3{1}	4122	2015	4.36	(16)	OCC	13.97	141.48	
Sus. + E4{1}	4122	2015	4.36	(16)	OCC	13.97	141.48	
Sus. + W1{1}	4122	3398	4.36	(16)	OCC	15.58	141.48	
Sus. + W2{1}	4122	3398	4.36	(16)	OCC	15.58	141.48	
Sus. + W3{1}	4122	1899	4.36	(16)	OCC	13.83	141.48	
Sus. + W4{1}	4122	1899	4.36	(16)	OCC	13.83	141.48	

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			Eq. no.	Load type	Code Stress	Code Allow.	
		(Moments in N.m )	(Stress in N/mm2 )						
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A10 + Max P{1}					( 3)	HOOP	19.66	117.90	
GR + Max P{1}		60077			(15)	SUST	28.24	117.90	
TR:Amb to T1{1}				11715	1.00	(17)	DISP	4.18	176.85
Amb to T1{1}				11715	1.00	(17)	DISP	4.18	176.85
Sus. + E1{1}		60077	323		1.00	(16)	OCC	28.36	141.48
Sus. + E2{1}		60077	323		1.00	(16)	OCC	28.36	141.48
Sus. + E3{1}		60077	924		1.00	(16)	OCC	28.57	141.48
Sus. + E4{1}		60077	924		1.00	(16)	OCC	28.57	141.48
Sus. + W1{1}		60077	1962		1.00	(16)	OCC	28.94	141.48
Sus. + W2{1}		60077	1962		1.00	(16)	OCC	28.94	141.48
Sus. + W3{1}		60077	1121		1.00	(16)	OCC	28.64	141.48
Sus. + W4{1}		60077	1121		1.00	(16)	OCC	28.64	141.48
A10 - Max P{1}					( 3)	HOOP	19.66	117.90	
GR + Max P{1}		60077			1.00	(15)	SUST	28.24	117.90
TR:Amb to T1{1}				11715	1.00	(17)	DISP	4.18	176.85
Amb to T1{1}				11715	1.00	(17)	DISP	4.18	176.85
Sus. + E1{1}		60077	323		1.00	(16)	OCC	28.36	141.48
Sus. + E2{1}		60077	323		1.00	(16)	OCC	28.36	141.48
Sus. + E3{1}		60077	924		1.00	(16)	OCC	28.57	141.48
Sus. + E4{1}		60077	924		1.00	(16)	OCC	28.57	141.48
Sus. + W1{1}		60077	1962		1.00	(16)	OCC	28.94	141.48
Sus. + W2{1}		60077	1962		1.00	(16)	OCC	28.94	141.48
Sus. + W3{1}		60077	1121		1.00	(16)	OCC	28.64	141.48
Sus. + W4{1}		60077	1121		1.00	(16)	OCC	28.64	141.48
A11 F- Max P{1}					( 3)	HOOP	19.66	117.90	
GR + Max P{1}		9906			4.36	(15)	SUST	18.37	117.90
TR:Amb to T1{1}				5284	4.36	(17)	DISP	8.23	176.85
Amb to T1{1}				5284	4.36	(17)	DISP	8.23	176.85
Sus. + E1{1}		9906	2165		4.36	(16)	OCC	20.89	141.48
Sus. + E2{1}		9906	2165		4.36	(16)	OCC	20.89	141.48
Sus. + E3{1}		9906	2466		4.36	(16)	OCC	21.25	141.48
Sus. + E4{1}		9906	2466		4.36	(16)	OCC	21.25	141.48
Sus. + W1{1}		9906	5479		4.36	(16)	OCC	24.77	141.48
Sus. + W2{1}		9906	5479		4.36	(16)	OCC	24.77	141.48
Sus. + W3{1}		9906	3030		4.36	(16)	OCC	21.90	141.48
Sus. + W4{1}		9906	3030		4.36	(16)	OCC	21.90	141.48
A14 F- Max P{1}					( 3)	HOOP	19.66	117.90	
GR + Max P{1}		4334			4.36	(15)	SUST	11.86	117.90
TR:Amb to T1{1}				2589	4.36	(17)	DISP	4.03	176.85
Amb to T1{1}				2589	4.36	(17)	DISP	4.03	176.85
Sus. + E1{1}		4334	5040		4.36	(16)	OCC	17.74	141.48
Sus. + E2{1}		4334	5040		4.36	(16)	OCC	17.74	141.48
Sus. + E3{1}		4334	2527		4.36	(16)	OCC	14.81	141.48
Sus. + E4{1}		4334	2527		4.36	(16)	OCC	14.81	141.48
Sus. + W1{1}		4334	8851		4.36	(16)	OCC	22.20	141.48

Sus. + W2{1}	4334	8851	4.36	(16)	OCC	22.20	141.48
Sus. + W3{1}	4334	4231	4.36	(16)	OCC	16.80	141.48
Sus. + W4{1}	4334	4231	4.36	(16)	OCC	16.80	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Moments in N.m )		(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type		
A09 N+	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	11591			4.36	(15)	SUST	20.33	117.90
	TR:Amb to T1{1}			9160	4.36	(17)	DISP	14.26	176.85
	Amb to T1{1}			9160	4.36	(17)	DISP	14.26	176.85
	Sus. + E1{1}	11591	1496		4.36	(16)	OCC	22.08	141.48
	Sus. + E2{1}	11591	1496		4.36	(16)	OCC	22.08	141.48
	Sus. + E3{1}	11591	959		4.36	(16)	OCC	21.45	141.48
	Sus. + E4{1}	11591	959		4.36	(16)	OCC	21.45	141.48
	Sus. + W1{1}	11591	966		4.36	(16)	OCC	21.46	141.48
	Sus. + W2{1}	11591	966		4.36	(16)	OCC	21.46	141.48
	Sus. + W3{1}	11591	1193		4.36	(16)	OCC	21.73	141.48
	Sus. + W4{1}	11591	1193		4.36	(16)	OCC	21.73	141.48
A02 N-	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	7041			1.00	(15)	SUST	9.31	117.90
	TR:Amb to T1{1}			58542	1.00	(17)	DISP	20.90	176.85
	Amb to T1{1}			58542	1.00	(17)	DISP	20.90	176.85
	Sus. + E1{1}	7041	3062		1.00	(16)	OCC	10.40	141.48
	Sus. + E2{1}	7041	3062		1.00	(16)	OCC	10.40	141.48
	Sus. + E3{1}	7041	3780		1.00	(16)	OCC	10.66	141.48
	Sus. + E4{1}	7041	3780		1.00	(16)	OCC	10.66	141.48
	Sus. + W1{1}	7041	3023		1.00	(16)	OCC	10.39	141.48
	Sus. + W2{1}	7041	3023		1.00	(16)	OCC	10.39	141.48
	Sus. + W3{1}	7041	3240		1.00	(16)	OCC	10.47	141.48
	Sus. + W4{1}	7041	3240		1.00	(16)	OCC	10.47	141.48
A00	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	8850			1.00	(15)	SUST	9.96	117.90
	TR:Amb to T1{1}			58200	1.00	(17)	DISP	20.78	176.85
	Amb to T1{1}			58200	1.00	(17)	DISP	20.78	176.85
	Sus. + E1{1}	8850	6584		1.00	(16)	OCC	12.31	141.48
	Sus. + E2{1}	8850	6584		1.00	(16)	OCC	12.31	141.48
	Sus. + E3{1}	8850	6589		1.00	(16)	OCC	12.31	141.48
	Sus. + E4{1}	8850	6589		1.00	(16)	OCC	12.31	141.48
	Sus. + W1{1}	8850	6233		1.00	(16)	OCC	12.18	141.48
	Sus. + W2{1}	8850	6233		1.00	(16)	OCC	12.18	141.48
	Sus. + W3{1}	8850	5502		1.00	(16)	OCC	11.92	141.48
	Sus. + W4{1}	8850	5502		1.00	(16)	OCC	11.92	141.48
A08 +	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	9568			1.00	(15)	SUST	10.21	117.90
	TR:Amb to T1{1}			27606	1.00	(17)	DISP	9.85	176.85
	Amb to T1{1}			27606	1.00	(17)	DISP	9.85	176.85
	Sus. + E1{1}	9568	18275		1.00	(16)	OCC	16.74	141.48
	Sus. + E2{1}	9568	18275		1.00	(16)	OCC	16.74	141.48
	Sus. + E3{1}	9568	11958		1.00	(16)	OCC	14.48	141.48
	Sus. + E4{1}	9568	11958		1.00	(16)	OCC	14.48	141.48
	Sus. + W1{1}	9568	28966		1.00	(16)	OCC	20.55	141.48
	Sus. + W2{1}	9568	28966		1.00	(16)	OCC	20.55	141.48
	Sus. + W3{1}	9568	14344		1.00	(16)	OCC	15.33	141.48
	Sus. + W4{1}	9568	14344		1.00	(16)	OCC	15.33	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A08 -	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	9568			1.00		(15) SUST	10.21	117.90
	TR:Amb to T1{1}			27606	1.00		(17) DISP	9.85	176.85
	Amb to T1{1}			27606	1.00		(17) DISP	9.85	176.85
	Sus. + E1{1}	9568	18275		1.00		(16) OCC	16.74	141.48
	Sus. + E2{1}	9568	18275		1.00		(16) OCC	16.74	141.48
	Sus. + E3{1}	9568	11958		1.00		(16) OCC	14.48	141.48
	Sus. + E4{1}	9568	11958		1.00		(16) OCC	14.48	141.48
	Sus. + W1{1}	9568	28966		1.00		(16) OCC	20.55	141.48
	Sus. + W2{1}	9568	28966		1.00		(16) OCC	20.55	141.48
	Sus. + W3{1}	9568	14344		1.00		(16) OCC	15.33	141.48
	Sus. + W4{1}	9568	14344		1.00		(16) OCC	15.33	141.48
A03 +	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	24554			1.00		(15) SUST	15.56	117.90
	TR:Amb to T1{1}			56477	1.00		(17) DISP	20.16	176.85
	Amb to T1{1}			56477	1.00		(17) DISP	20.16	176.85
	Sus. + E1{1}	24554	4686		1.00		(16) OCC	17.24	141.48
	Sus. + E2{1}	24554	4686		1.00		(16) OCC	17.24	141.48
	Sus. + E3{1}	24554	11553		1.00		(16) OCC	19.69	141.48
	Sus. + E4{1}	24554	11553		1.00		(16) OCC	19.69	141.48
	Sus. + W1{1}	24554	5838		1.00		(16) OCC	17.65	141.48
	Sus. + W2{1}	24554	5838		1.00		(16) OCC	17.65	141.48
	Sus. + W3{1}	24554	10411		1.00		(16) OCC	19.28	141.48
	Sus. + W4{1}	24554	10411		1.00		(16) OCC	19.28	141.48
A03 -	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	24554			1.00		(15) SUST	15.56	117.90
	TR:Amb to T1{1}			56477	1.00		(17) DISP	20.16	176.85
	Amb to T1{1}			56477	1.00		(17) DISP	20.16	176.85
	Sus. + E1{1}	24554	4686		1.00		(16) OCC	17.24	141.48
	Sus. + E2{1}	24554	4686		1.00		(16) OCC	17.24	141.48
	Sus. + E3{1}	24554	11553		1.00		(16) OCC	19.69	141.48
	Sus. + E4{1}	24554	11553		1.00		(16) OCC	19.69	141.48
	Sus. + W1{1}	24554	5838		1.00		(16) OCC	17.65	141.48
	Sus. + W2{1}	24554	5838		1.00		(16) OCC	17.65	141.48
	Sus. + W3{1}	24554	10411		1.00		(16) OCC	19.28	141.48
	Sus. + W4{1}	24554	10411		1.00		(16) OCC	19.28	141.48
A15	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	2813			1.00		(15) SUST	7.80	117.90
	TR:Amb to T1{1}			2988	1.00		(17) DISP	1.07	176.85
	Amb to T1{1}			2988	1.00		(17) DISP	1.07	176.85
	Sus. + E1{1}	2813	10976		1.00		(16) OCC	11.72	141.48
	Sus. + E2{1}	2813	10976		1.00		(16) OCC	11.72	141.48
	Sus. + E3{1}	2813	10916		1.00		(16) OCC	11.70	141.48
	Sus. + E4{1}	2813	10916		1.00		(16) OCC	11.70	141.48
	Sus. + W1{1}	2813	21864		1.00		(16) OCC	15.61	141.48
	Sus. + W2{1}	2813	21864		1.00		(16) OCC	15.61	141.48
	Sus. + W3{1}	2813	17258		1.00		(16) OCC	13.96	141.48
	Sus. + W4{1}	2813	17258		1.00		(16) OCC	13.96	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A14 F+	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	4334			1.00		(15) SUST	8.34	117.90

TR:Amb to T1{1}			2589	1.00	(17)	DISP	0.92	176.85
Amb to T1{1}			2589	1.00	(17)	DISP	0.92	176.85
Sus. + E1{1}	4334	5040		1.00	(16)	OCC	10.14	141.48
Sus. + E2{1}	4334	5040		1.00	(16)	OCC	10.14	141.48
Sus. + E3{1}	4334	2527		1.00	(16)	OCC	9.25	141.48
Sus. + E4{1}	4334	2527		1.00	(16)	OCC	9.25	141.48
Sus. + W1{1}	4334	8851		1.00	(16)	OCC	11.50	141.48
Sus. + W2{1}	4334	8851		1.00	(16)	OCC	11.50	141.48
Sus. + W3{1}	4334	4231		1.00	(16)	OCC	9.86	141.48
Sus. + W4{1}	4334	4231		1.00	(16)	OCC	9.86	141.48
A14 N+ Max P{1}								
GR + Max P{1}	1758				( 3)	HOOP	19.66	117.90
TR:Amb to T1{1}				4.36	(15)	SUST	8.85	117.90
Amb to T1{1}			1856	4.36	(17)	DISP	2.89	176.85
Sus. + E1{1}	1758	3812	1856	4.36	(17)	DISP	2.89	176.85
Sus. + E2{1}	1758	3812		4.36	(16)	OCC	13.30	141.48
Sus. + E3{1}	1758	2023		4.36	(16)	OCC	13.30	141.48
Sus. + E4{1}	1758	2023		4.36	(16)	OCC	11.21	141.48
Sus. + W1{1}	1758	6172		4.36	(16)	OCC	11.21	141.48
Sus. + W2{1}	1758	6172		4.36	(16)	OCC	16.06	141.48
Sus. + W3{1}	1758	3558		4.36	(16)	OCC	16.06	141.48
Sus. + W4{1}	1758	3558		4.36	(16)	OCC	13.01	141.48
A14 N- Max P{1}								
GR + Max P{1}	1758				( 3)	HOOP	19.66	117.90
TR:Amb to T1{1}				1.00	(15)	SUST	7.42	117.90
Amb to T1{1}			1856	1.00	(17)	DISP	0.66	176.85
Sus. + E1{1}	1758	3812	1856	1.00	(17)	DISP	0.66	176.85
Sus. + E2{1}	1758	3812		1.00	(16)	OCC	8.79	141.48
Sus. + E3{1}	1758	2023		1.00	(16)	OCC	8.79	141.48
Sus. + E4{1}	1758	2023		1.00	(16)	OCC	8.15	141.48
Sus. + W1{1}	1758	6172		1.00	(16)	OCC	8.15	141.48
Sus. + W2{1}	1758	6172		1.00	(16)	OCC	9.63	141.48
Sus. + W3{1}	1758	3558		1.00	(16)	OCC	9.63	141.48
Sus. + W4{1}	1758	3558		1.00	(16)	OCC	8.70	141.48
A13 F+ Max P{1}								
GR + Max P{1}	4774				( 3)	HOOP	19.66	117.90
TR:Amb to T1{1}				1.00	(15)	SUST	8.50	117.90
Amb to T1{1}			3136	1.00	(17)	DISP	1.12	176.85
Sus. + E1{1}	4774	2797	3136	1.00	(17)	DISP	1.12	176.85
Sus. + E2{1}	4774	2797		1.00	(16)	OCC	9.50	141.48
Sus. + E3{1}	4774	1286		1.00	(16)	OCC	9.50	141.48
Sus. + E4{1}	4774	1286		1.00	(16)	OCC	8.96	141.48
Sus. + W1{1}	4774	5612		1.00	(16)	OCC	8.96	141.48
Sus. + W2{1}	4774	5612		1.00	(16)	OCC	10.50	141.48
Sus. + W3{1}	4774	2069		1.00	(16)	OCC	10.50	141.48
Sus. + W4{1}	4774	2069		1.00	(16)	OCC	9.24	141.48

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Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type		
A13 F- Max P{1}								
GR + Max P{1}		4774				( 3) HOOP	19.66	117.90
TR:Amb to T1{1}					4.36	(15) SUST	12.37	117.90
Amb to T1{1}				3136	4.36	(17) DISP	4.88	176.85
Sus. + E1{1}		4774	2797	3136	4.36	(17) DISP	4.88	176.85
Sus. + E2{1}		4774	2797		4.36	(16) OCC	15.64	141.48
Sus. + E3{1}		4774	1286		4.36	(16) OCC	13.87	141.48
Sus. + E4{1}		4774	1286		4.36	(16) OCC	13.87	141.48
Sus. + W1{1}		4774	5612		4.36	(16) OCC	18.93	141.48
Sus. + W2{1}		4774	5612		4.36	(16) OCC	18.93	141.48
Sus. + W3{1}		4774	2069		4.36	(16) OCC	14.79	141.48
Sus. + W4{1}		4774	2069		4.36	(16) OCC	14.79	141.48
A13 N+ Max P{1}								
GR + Max P{1}		2222				( 3) HOOP	19.66	117.90
TR:Amb to T1{1}					4.36	(15) SUST	9.39	117.90
Amb to T1{1}				3959	4.36	(17) DISP	6.16	176.85
Sus. + E1{1}		2222	3632	3959	4.36	(17) DISP	6.16	176.85
Sus. + E2{1}		2222	3632		4.36	(16) OCC	13.63	141.48



Sus. + E3{1}	2222	1603	4.36	(16)	OCC	11.26	141.48
Sus. + E4{1}	2222	1603	4.36	(16)	OCC	11.26	141.48
Sus. + W1{1}	2222	7495	4.36	(16)	OCC	18.14	141.48
Sus. + W2{1}	2222	7495	4.36	(16)	OCC	18.14	141.48
Sus. + W3{1}	2222	2854	4.36	(16)	OCC	12.73	141.48
Sus. + W4{1}	2222	2854	4.36	(16)	OCC	12.73	141.48
A13 N- Max P{1}							
GR + Max P{1}	2222		1.00	(15)	SUST	7.59	117.90
TR:Amb to T1{1}			3959	1.00	(17)	DISP	1.41 176.85
Amb to T1{1}			3959	1.00	(17)	DISP	1.41 176.85
Sus. + E1{1}	2222	3632	1.00	(16)	OCC	8.89	141.48
Sus. + E2{1}	2222	3632	1.00	(16)	OCC	8.89	141.48
Sus. + E3{1}	2222	1603	1.00	(16)	OCC	8.16	141.48
Sus. + E4{1}	2222	1603	1.00	(16)	OCC	8.16	141.48
Sus. + W1{1}	2222	7495	1.00	(16)	OCC	10.27	141.48
Sus. + W2{1}	2222	7495	1.00	(16)	OCC	10.27	141.48
Sus. + W3{1}	2222	2854	1.00	(16)	OCC	8.61	141.48
Sus. + W4{1}	2222	2854	1.00	(16)	OCC	8.61	141.48
A12 + Max P{1}							
GR + Max P{1}	10230		1.00	(15)	SUST	10.45	117.90
TR:Amb to T1{1}			5365	1.00	(17)	DISP	1.92 176.85
Amb to T1{1}			5365	1.00	(17)	DISP	1.92 176.85
Sus. + E1{1}	10230	2244	1.00	(16)	OCC	11.25	141.48
Sus. + E2{1}	10230	2244	1.00	(16)	OCC	11.25	141.48
Sus. + E3{1}	10230	2704	1.00	(16)	OCC	11.41	141.48
Sus. + E4{1}	10230	2704	1.00	(16)	OCC	11.41	141.48
Sus. + W1{1}	10230	5602	1.00	(16)	OCC	12.45	141.48
Sus. + W2{1}	10230	5602	1.00	(16)	OCC	12.45	141.48
Sus. + W3{1}	10230	3217	1.00	(16)	OCC	11.60	141.48
Sus. + W4{1}	10230	3217	1.00	(16)	OCC	11.60	141.48

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ASME B31.1 (2014) CODE COMPLIANCE							
		(Moments in N.m )			(Stress in N/mm2 )		
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress Allow.
-----							
A12 -	Max P{1}					( 3) HOOP	19.66 117.90
	GR + Max P{1}	10230			1.00	(15) SUST	10.45 117.90
	TR:Amb to T1{1}			5365	1.00	(17) DISP	1.92 176.85
	Amb to T1{1}			5365	1.00	(17) DISP	1.92 176.85
	Sus. + E1{1}	10230	2244		1.00	(16) OCC	11.25 141.48
	Sus. + E2{1}	10230	2244		1.00	(16) OCC	11.25 141.48
	Sus. + E3{1}	10230	2704		1.00	(16) OCC	11.41 141.48
	Sus. + E4{1}	10230	2704		1.00	(16) OCC	11.41 141.48
	Sus. + W1{1}	10230	5602		1.00	(16) OCC	12.45 141.48
	Sus. + W2{1}	10230	5602		1.00	(16) OCC	12.45 141.48
	Sus. + W3{1}	10230	3217		1.00	(16) OCC	11.60 141.48
	Sus. + W4{1}	10230	3217		1.00	(16) OCC	11.60 141.48
-----							
A11 F+	Max P{1}					( 3) HOOP	19.66 117.90
	GR + Max P{1}	9906			1.00	(15) SUST	10.33 117.90
	TR:Amb to T1{1}			5284	1.00	(17) DISP	1.89 176.85
	Amb to T1{1}			5284	1.00	(17) DISP	1.89 176.85
	Sus. + E1{1}	9906	2165		1.00	(16) OCC	11.11 141.48
	Sus. + E2{1}	9906	2165		1.00	(16) OCC	11.11 141.48
	Sus. + E3{1}	9906	2466		1.00	(16) OCC	11.21 141.48
	Sus. + E4{1}	9906	2466		1.00	(16) OCC	11.21 141.48
	Sus. + W1{1}	9906	5479		1.00	(16) OCC	12.29 141.48
	Sus. + W2{1}	9906	5479		1.00	(16) OCC	12.29 141.48
	Sus. + W3{1}	9906	3030		1.00	(16) OCC	11.42 141.48
	Sus. + W4{1}	9906	3030		1.00	(16) OCC	11.42 141.48
-----							
A11 N+	Max P{1}					( 3) HOOP	19.66 117.90
	GR + Max P{1}	7454			4.36	(15) SUST	15.50 117.90
	TR:Amb to T1{1}			7812	4.36	(17) DISP	12.16 176.85
	Amb to T1{1}			7812	4.36	(17) DISP	12.16 176.85
	Sus. + E1{1}	7454	898		4.36	(16) OCC	16.55 141.48
	Sus. + E2{1}	7454	898		4.36	(16) OCC	16.55 141.48
	Sus. + E3{1}	7454	548		4.36	(16) OCC	16.14 141.48
	Sus. + E4{1}	7454	548		4.36	(16) OCC	16.14 141.48
	Sus. + W1{1}	7454	2937		4.36	(16) OCC	18.93 141.48
	Sus. + W2{1}	7454	2937		4.36	(16) OCC	18.93 141.48

Sus. + W3{1}	7454	1218		4.36	(16)	OCC	16.93	141.48
Sus. + W4{1}	7454	1218		4.36	(16)	OCC	16.93	141.48
All N- Max P{1}					( 3)	HOOP	19.66	117.90
GR + Max P{1}	7454			1.00	(15)	SUST	9.46	117.90
TR:Amb to T1{1}			7812	1.00	(17)	DISP	2.79	176.85
Amb to T1{1}			7812	1.00	(17)	DISP	2.79	176.85
Sus. + E1{1}	7454	898		1.00	(16)	OCC	9.78	141.48
Sus. + E2{1}	7454	898		1.00	(16)	OCC	9.78	141.48
Sus. + E3{1}	7454	548		1.00	(16)	OCC	9.65	141.48
Sus. + E4{1}	7454	548		1.00	(16)	OCC	9.65	141.48
Sus. + W1{1}	7454	2937		1.00	(16)	OCC	10.51	141.48
Sus. + W2{1}	7454	2937		1.00	(16)	OCC	10.51	141.48
Sus. + W3{1}	7454	1218		1.00	(16)	OCC	9.89	141.48
Sus. + W4{1}	7454	1218		1.00	(16)	OCC	9.89	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A09 F+	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	21779			1.00	(15)	SUST	14.57	117.90
	TR:Amb to T1{1}			7271	1.00	(17)	DISP	2.60	176.85
	Amb to T1{1}			7271	1.00	(17)	DISP	2.60	176.85
	Sus. + E1{1}	21779	641		1.00	(16)	OCC	14.80	141.48
	Sus. + E2{1}	21779	641		1.00	(16)	OCC	14.80	141.48
	Sus. + E3{1}	21779	992		1.00	(16)	OCC	14.93	141.48
	Sus. + E4{1}	21779	992		1.00	(16)	OCC	14.93	141.48
	Sus. + W1{1}	21779	1996		1.00	(16)	OCC	15.28	141.48
	Sus. + W2{1}	21779	1996		1.00	(16)	OCC	15.28	141.48
	Sus. + W3{1}	21779	1042		1.00	(16)	OCC	14.94	141.48
	Sus. + W4{1}	21779	1042		1.00	(16)	OCC	14.94	141.48
A09 N-	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	11591			1.00	(15)	SUST	10.94	117.90
	TR:Amb to T1{1}			9160	1.00	(17)	DISP	3.27	176.85
	Amb to T1{1}			9160	1.00	(17)	DISP	3.27	176.85
	Sus. + E1{1}	11591	1496		1.00	(16)	OCC	11.47	141.48
	Sus. + E2{1}	11591	1496		1.00	(16)	OCC	11.47	141.48
	Sus. + E3{1}	11591	959		1.00	(16)	OCC	11.28	141.48
	Sus. + E4{1}	11591	959		1.00	(16)	OCC	11.28	141.48
	Sus. + W1{1}	11591	966		1.00	(16)	OCC	11.28	141.48
	Sus. + W2{1}	11591	966		1.00	(16)	OCC	11.28	141.48
	Sus. + W3{1}	11591	1193		1.00	(16)	OCC	11.36	141.48
	Sus. + W4{1}	11591	1193		1.00	(16)	OCC	11.36	141.48
A07 F+	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	11746			1.00	(15)	SUST	10.99	117.90
	TR:Amb to T1{1}			16598	1.00	(17)	DISP	5.92	176.85
	Amb to T1{1}			16598	1.00	(17)	DISP	5.92	176.85
	Sus. + E1{1}	11746	1615		1.00	(16)	OCC	11.57	141.48
	Sus. + E2{1}	11746	1615		1.00	(16)	OCC	11.57	141.48
	Sus. + E3{1}	11746	2071		1.00	(16)	OCC	11.73	141.48
	Sus. + E4{1}	11746	2071		1.00	(16)	OCC	11.73	141.48
	Sus. + W1{1}	11746	3226		1.00	(16)	OCC	12.14	141.48
	Sus. + W2{1}	11746	3226		1.00	(16)	OCC	12.14	141.48
	Sus. + W3{1}	11746	2234		1.00	(16)	OCC	11.79	141.48
	Sus. + W4{1}	11746	2234		1.00	(16)	OCC	11.79	141.48
A07 N-	Max P{1}					( 3)	HOOP	19.66	117.90
	GR + Max P{1}	11028			1.00	(15)	SUST	10.73	117.90
	TR:Amb to T1{1}			17112	1.00	(17)	DISP	6.11	176.85
	Amb to T1{1}			17112	1.00	(17)	DISP	6.11	176.85
	Sus. + E1{1}	11028	1507		1.00	(16)	OCC	11.27	141.48
	Sus. + E2{1}	11028	1507		1.00	(16)	OCC	11.27	141.48
	Sus. + E3{1}	11028	2343		1.00	(16)	OCC	11.57	141.48
	Sus. + E4{1}	11028	2343		1.00	(16)	OCC	11.57	141.48
	Sus. + W1{1}	11028	2440		1.00	(16)	OCC	11.61	141.48
	Sus. + W2{1}	11028	2440		1.00	(16)	OCC	11.61	141.48
	Sus. + W3{1}	11028	2537		1.00	(16)	OCC	11.64	141.48
	Sus. + W4{1}	11028	2537		1.00	(16)	OCC	11.64	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A06 F+	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	12702			1.00		(15) SUST	11.33	117.90
	TR:Amb to T1{1}			12011	1.00		(17) DISP	4.29	176.85
	Amb to T1{1}			12011	1.00		(17) DISP	4.29	176.85
	Sus. + E1{1}	12702	4278		1.00		(16) OCC	12.86	141.48
	Sus. + E2{1}	12702	4278		1.00		(16) OCC	12.86	141.48
	Sus. + E3{1}	12702	3437		1.00		(16) OCC	12.56	141.48
	Sus. + E4{1}	12702	3437		1.00		(16) OCC	12.56	141.48
	Sus. + W1{1}	12702	5076		1.00		(16) OCC	13.14	141.48
	Sus. + W2{1}	12702	5076		1.00		(16) OCC	13.14	141.48
	Sus. + W3{1}	12702	4114		1.00		(16) OCC	12.80	141.48
	Sus. + W4{1}	12702	4114		1.00		(16) OCC	12.80	141.48
A06 N-	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	12628			1.00		(15) SUST	11.31	117.90
	TR:Amb to T1{1}			12212	1.00		(17) DISP	4.36	176.85
	Amb to T1{1}			12212	1.00		(17) DISP	4.36	176.85
	Sus. + E1{1}	12628	4289		1.00		(16) OCC	12.84	141.48
	Sus. + E2{1}	12628	4289		1.00		(16) OCC	12.84	141.48
	Sus. + E3{1}	12628	3310		1.00		(16) OCC	12.49	141.48
	Sus. + E4{1}	12628	3310		1.00		(16) OCC	12.49	141.48
	Sus. + W1{1}	12628	5167		1.00		(16) OCC	13.15	141.48
	Sus. + W2{1}	12628	5167		1.00		(16) OCC	13.15	141.48
	Sus. + W3{1}	12628	3984		1.00		(16) OCC	12.73	141.48
	Sus. + W4{1}	12628	3984		1.00		(16) OCC	12.73	141.48
A05 F+	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	4258			1.00		(15) SUST	8.32	117.90
	TR:Amb to T1{1}			24947	1.00		(17) DISP	8.91	176.85
	Amb to T1{1}			24947	1.00		(17) DISP	8.91	176.85
	Sus. + E1{1}	4258	3932		1.00		(16) OCC	9.72	141.48
	Sus. + E2{1}	4258	3932		1.00		(16) OCC	9.72	141.48
	Sus. + E3{1}	4258	940		1.00		(16) OCC	8.65	141.48
	Sus. + E4{1}	4258	940		1.00		(16) OCC	8.65	141.48
	Sus. + W1{1}	4258	4912		1.00		(16) OCC	10.07	141.48
	Sus. + W2{1}	4258	4912		1.00		(16) OCC	10.07	141.48
	Sus. + W3{1}	4258	896		1.00		(16) OCC	8.64	141.48
	Sus. + W4{1}	4258	896		1.00		(16) OCC	8.64	141.48
A05 N-	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	3219			1.00		(15) SUST	7.95	117.90
	TR:Amb to T1{1}			23356	1.00		(17) DISP	8.34	176.85
	Amb to T1{1}			23356	1.00		(17) DISP	8.34	176.85
	Sus. + E1{1}	3219	2609		1.00		(16) OCC	8.88	141.48
	Sus. + E2{1}	3219	2609		1.00		(16) OCC	8.88	141.48
	Sus. + E3{1}	3219	2043		1.00		(16) OCC	8.68	141.48
	Sus. + E4{1}	3219	2043		1.00		(16) OCC	8.68	141.48
	Sus. + W1{1}	3219	3167		1.00		(16) OCC	9.08	141.48
	Sus. + W2{1}	3219	3167		1.00		(16) OCC	9.08	141.48
	Sus. + W3{1}	3219	2448		1.00		(16) OCC	8.82	141.48
	Sus. + W4{1}	3219	2448		1.00		(16) OCC	8.82	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A04 F+	Max P{1}						( 3) HOOP	19.66	117.90
	GR + Max P{1}	4122			1.00		(15) SUST	8.27	117.90

TR:Amb to T1{1}			19634	1.00	(17)	DISP	7.01	176.85		
Amb to T1{1}			19634	1.00	(17)	DISP	7.01	176.85		
Sus. + E1{1}	4122	2868		1.00	(16)	OCC	9.29	141.48		
Sus. + E2{1}	4122	2868		1.00	(16)	OCC	9.29	141.48		
Sus. + E3{1}	4122	2015		1.00	(16)	OCC	8.99	141.48		
Sus. + E4{1}	4122	2015		1.00	(16)	OCC	8.99	141.48		
Sus. + W1{1}	4122	3398		1.00	(16)	OCC	9.48	141.48		
Sus. + W2{1}	4122	3398		1.00	(16)	OCC	9.48	141.48		
Sus. + W3{1}	4122	1899		1.00	(16)	OCC	8.95	141.48		
Sus. + W4{1}	4122	1899		1.00	(16)	OCC	8.95	141.48		
A04 N- Max P{1}							( 3)	HOOP	19.66	117.90
GR + Max P{1}	9219			1.00	(15)	SUST	10.09	117.90		
TR:Amb to T1{1}			33744	1.00	(17)	DISP	12.05	176.85		
Amb to T1{1}			33744	1.00	(17)	DISP	12.05	176.85		
Sus. + E1{1}	9219	5267		1.00	(16)	OCC	11.97	141.48		
Sus. + E2{1}	9219	5267		1.00	(16)	OCC	11.97	141.48		
Sus. + E3{1}	9219	2497		1.00	(16)	OCC	10.98	141.48		
Sus. + E4{1}	9219	2497		1.00	(16)	OCC	10.98	141.48		
Sus. + W1{1}	9219	6470		1.00	(16)	OCC	12.40	141.48		
Sus. + W2{1}	9219	6470		1.00	(16)	OCC	12.40	141.48		
Sus. + W3{1}	9219	2029		1.00	(16)	OCC	10.81	141.48		
Sus. + W4{1}	9219	2029		1.00	(16)	OCC	10.81	141.48		
A02 F+ Max P{1}							( 3)	HOOP	19.66	117.90
GR + Max P{1}	9690			1.00	(15)	SUST	10.26	117.90		
TR:Amb to T1{1}			28105	1.00	(17)	DISP	10.03	176.85		
Amb to T1{1}			28105	1.00	(17)	DISP	10.03	176.85		
Sus. + E1{1}	9690	2346		1.00	(16)	OCC	11.09	141.48		
Sus. + E2{1}	9690	2346		1.00	(16)	OCC	11.09	141.48		
Sus. + E3{1}	9690	3905		1.00	(16)	OCC	11.65	141.48		
Sus. + E4{1}	9690	3905		1.00	(16)	OCC	11.65	141.48		
Sus. + W1{1}	9690	2624		1.00	(16)	OCC	11.19	141.48		
Sus. + W2{1}	9690	2624		1.00	(16)	OCC	11.19	141.48		
Sus. + W3{1}	9690	3415		1.00	(16)	OCC	11.48	141.48		
Sus. + W4{1}	9690	3415		1.00	(16)	OCC	11.48	141.48		

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R E S U L T   S U M M A R Y  
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Maximum sustained stress ratio

Point : A06 F  
Stress N/mm2 : 34.81  
Allowable N/mm2 : 117.90  
Ratio : 0.30  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A02 N  
Stress N/mm2 : 91.16  
Allowable N/mm2 : 176.85  
Ratio : 0.52  
Load combination : Max Range

Maximum occasional stress ratio

Point : A06 N  
Stress N/mm2 : 46.04  
Allowable N/mm2 : 141.48  
Ratio : 0.33  
Load combination : Sus. + W1{1}

Maximum hoop stress ratio

Point : A02 N  
Stress N/mm2 : 19.66  
Allowable N/mm2 : 117.90  
Ratio : 0.17  
Load combination : Max P{1}

## **LAMPIRAN O**

*GENERAL PIPE STRESS REPORT (OPERATING CONDITION WITH  
EXPANSION JOINT, PIPE THICKNESS = 7,989 mm)*

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 Operating Condition with Expansion Joint  
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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )			S.I.F				
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)					
A07 F-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	14983			8.51	(15)	SUST	43.45	117.90
	TR:Amb to T1{1}			1909	8.51	(17)	DISP	6.15	176.85
	Amb to T1{1}			1909	8.51	(17)	DISP	6.15	176.85
	Sus. + E1{1}	14983	1132		8.51	(16)	OCC	46.19	141.48
	Sus. + E2{1}	14983	1132		8.51	(16)	OCC	46.19	141.48
	Sus. + E3{1}	14983	3141		8.51	(16)	OCC	51.05	141.48
	Sus. + E4{1}	14983	3141		8.51	(16)	OCC	51.05	141.48
	Sus. + W1{1}	14983	3306		8.51	(16)	OCC	51.44	141.48
	Sus. + W2{1}	14983	3306		8.51	(16)	OCC	51.44	141.48
	Sus. + W3{1}	14983	2959		8.51	(16)	OCC	50.61	141.48
	Sus. + W4{1}	14983	2959		8.51	(16)	OCC	50.61	141.48
A07 N+	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	14355			8.51	(15)	SUST	41.93	117.90
	TR:Amb to T1{1}			1949	8.51	(17)	DISP	6.28	176.85
	Amb to T1{1}			1949	8.51	(17)	DISP	6.28	176.85
	Sus. + E1{1}	14355	1306		8.51	(16)	OCC	45.09	141.48
	Sus. + E2{1}	14355	1306		8.51	(16)	OCC	45.09	141.48
	Sus. + E3{1}	14355	3257		8.51	(16)	OCC	49.81	141.48
	Sus. + E4{1}	14355	3257		8.51	(16)	OCC	49.81	141.48
	Sus. + W1{1}	14355	2404		8.51	(16)	OCC	47.75	141.48
	Sus. + W2{1}	14355	2404		8.51	(16)	OCC	47.75	141.48
	Sus. + W3{1}	14355	3160		8.51	(16)	OCC	49.57	141.48
	Sus. + W4{1}	14355	3160		8.51	(16)	OCC	49.57	141.48
A06 N+	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	12143			8.51	(15)	SUST	36.59	117.90
	TR:Amb to T1{1}			1826	8.51	(17)	DISP	5.89	176.85
	Amb to T1{1}			1826	8.51	(17)	DISP	5.89	176.85
	Sus. + E1{1}	12143	4511		8.51	(16)	OCC	47.49	141.48
	Sus. + E2{1}	12143	4511		8.51	(16)	OCC	47.49	141.48
	Sus. + E3{1}	12143	3558		8.51	(16)	OCC	45.19	141.48
	Sus. + E4{1}	12143	3558		8.51	(16)	OCC	45.19	141.48
	Sus. + W1{1}	12143	5198		8.51	(16)	OCC	49.15	141.48
	Sus. + W2{1}	12143	5198		8.51	(16)	OCC	49.15	141.48
	Sus. + W3{1}	12143	3966		8.51	(16)	OCC	46.18	141.48
	Sus. + W4{1}	12143	3966		8.51	(16)	OCC	46.18	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )			S.I.F				
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)					
A06 F-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	12209			8.51	(15)	SUST	36.75	117.90
	TR:Amb to T1{1}			1789	8.51	(17)	DISP	5.77	176.85
	Amb to T1{1}			1789	8.51	(17)	DISP	5.77	176.85
	Sus. + E1{1}	12209	4393		8.51	(16)	OCC	47.37	141.48
	Sus. + E2{1}	12209	4393		8.51	(16)	OCC	47.37	141.48
	Sus. + E3{1}	12209	3616		8.51	(16)	OCC	45.49	141.48
	Sus. + E4{1}	12209	3616		8.51	(16)	OCC	45.49	141.48
	Sus. + W1{1}	12209	5011		8.51	(16)	OCC	48.86	141.48
	Sus. + W2{1}	12209	5011		8.51	(16)	OCC	48.86	141.48
	Sus. + W3{1}	12209	4044		8.51	(16)	OCC	46.52	141.48
	Sus. + W4{1}	12209	4044		8.51	(16)	OCC	46.52	141.48
A09 F-	Max P{1}					( 3)	HOOP	21.30	117.90

GR + Max P{1}	22722		4.47	(15)	SUST	36.11	117.90
TR:Amb to T1{1}			1216	4.47	(17)	DISP	2.06 176.85
Amb to T1{1}			1216	4.47	(17)	DISP	2.06 176.85
Sus. + E1{1}	22722	1586	4.47	(16)	OCC	38.12	141.48
Sus. + E2{1}	22722	1586	4.47	(16)	OCC	38.12	141.48
Sus. + E3{1}	22722	1999	4.47	(16)	OCC	38.65	141.48
Sus. + E4{1}	22722	1999	4.47	(16)	OCC	38.65	141.48
Sus. + W1{1}	22722	2388	4.47	(16)	OCC	39.14	141.48
Sus. + W2{1}	22722	2388	4.47	(16)	OCC	39.14	141.48
Sus. + W3{1}	22722	1782	4.47	(16)	OCC	38.37	141.48
Sus. + W4{1}	22722	1782	4.47	(16)	OCC	38.37	141.48
A10 + Max P{1}							
GR + Max P{1}	60273			( 3)	HOOP	21.30	117.90
TR:Amb to T1{1}			1254	1.00	(15)	SUST	30.07 117.90
Amb to T1{1}			1254	1.00	(17)	DISP	0.48 176.85
Sus. + E1{1}	60273	1943	1.00	(16)	OCC	30.81	141.48
Sus. + E2{1}	60273	1943	1.00	(16)	OCC	30.81	141.48
Sus. + E3{1}	60273	1514	1.00	(16)	OCC	30.65	141.48
Sus. + E4{1}	60273	1514	1.00	(16)	OCC	30.65	141.48
Sus. + W1{1}	60273	2241	1.00	(16)	OCC	30.92	141.48
Sus. + W2{1}	60273	2241	1.00	(16)	OCC	30.92	141.48
Sus. + W3{1}	60273	1417	1.00	(16)	OCC	30.61	141.48
Sus. + W4{1}	60273	1417	1.00	(16)	OCC	30.61	141.48
A10 - Max P{1}							
GR + Max P{1}	60273			( 3)	HOOP	21.30	117.90
TR:Amb to T1{1}			1254	1.00	(15)	SUST	30.07 117.90
Amb to T1{1}			1254	1.00	(17)	DISP	0.48 176.85
Sus. + E1{1}	60273	1943	1.00	(16)	OCC	30.81	141.48
Sus. + E2{1}	60273	1943	1.00	(16)	OCC	30.81	141.48
Sus. + E3{1}	60273	1514	1.00	(16)	OCC	30.65	141.48
Sus. + E4{1}	60273	1514	1.00	(16)	OCC	30.65	141.48
Sus. + W1{1}	60273	2241	1.00	(16)	OCC	30.92	141.48
Sus. + W2{1}	60273	2241	1.00	(16)	OCC	30.92	141.48
Sus. + W3{1}	60273	1417	1.00	(16)	OCC	30.61	141.48
Sus. + W4{1}	60273	1417	1.00	(16)	OCC	30.61	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m )			S.I.F	no. type			
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)					
A02 F-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	10240			4.47	(15)	SUST	20.25	117.90
	TR:Amb to T1{1}			2208	4.47	(17)	DISP	3.74	176.85
	Amb to T1{1}			2208	4.47	(17)	DISP	3.74	176.85
	Sus. + E1{1}	10240	8051		4.47	(16)	OCC	30.48	141.48
	Sus. + E2{1}	10240	8051		4.47	(16)	OCC	30.48	141.48
	Sus. + E3{1}	10240	5900		4.47	(16)	OCC	27.74	141.48
	Sus. + E4{1}	10240	5900		4.47	(16)	OCC	27.74	141.48
	Sus. + W1{1}	10240	7357		4.47	(16)	OCC	29.60	141.48
	Sus. + W2{1}	10240	7357		4.47	(16)	OCC	29.60	141.48
	Sus. + W3{1}	10240	5130		4.47	(16)	OCC	26.77	141.48
	Sus. + W4{1}	10240	5130		4.47	(16)	OCC	26.77	141.48
A11 F-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	10511			4.47	(15)	SUST	20.59	117.90
	TR:Amb to T1{1}			899	4.47	(17)	DISP	1.52	176.85
	Amb to T1{1}			899	4.47	(17)	DISP	1.52	176.85
	Sus. + E1{1}	10511	2469		4.47	(16)	OCC	23.73	141.48
	Sus. + E2{1}	10511	2469		4.47	(16)	OCC	23.73	141.48
	Sus. + E3{1}	10511	2642		4.47	(16)	OCC	23.95	141.48
	Sus. + E4{1}	10511	2642		4.47	(16)	OCC	23.95	141.48
	Sus. + W1{1}	10511	5754		4.47	(16)	OCC	27.90	141.48
	Sus. + W2{1}	10511	5754		4.47	(16)	OCC	27.90	141.48
	Sus. + W3{1}	10511	3543		4.47	(16)	OCC	25.09	141.48
	Sus. + W4{1}	10511	3543		4.47	(16)	OCC	25.09	141.48
A14 F-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	4826			4.47	(15)	SUST	13.37	117.90
	TR:Amb to T1{1}			243	4.47	(17)	DISP	0.41	176.85
	Amb to T1{1}			243	4.47	(17)	DISP	0.41	176.85
	Sus. + E1{1}	4826	5636		4.47	(16)	OCC	20.53	141.48

Sus. + E2{1}	4826	5636	4.47	(16)	OCC	20.53	141.48
Sus. + E3{1}	4826	2744	4.47	(16)	OCC	16.85	141.48
Sus. + E4{1}	4826	2744	4.47	(16)	OCC	16.85	141.48
Sus. + W1{1}	4826	10391	4.47	(16)	OCC	26.57	141.48
Sus. + W2{1}	4826	10391	4.47	(16)	OCC	26.57	141.48
Sus. + W3{1}	4826	5007	4.47	(16)	OCC	19.73	141.48
Sus. + W4{1}	4826	5007	4.47	(16)	OCC	19.73	141.48

A09 N+ Max P{1}				( 3)	HOOP	21.30	117.90
GR + Max P{1}	11588			4.47	(15) SUST	21.96	117.90
TR:Amb to T1{1}			1293	4.47	(17) DISP	2.19	176.85
Amb to T1{1}			1293	4.47	(17) DISP	2.19	176.85
Sus. + E1{1}	11588	2090		4.47	(16) OCC	24.61	141.48
Sus. + E2{1}	11588	2090		4.47	(16) OCC	24.61	141.48
Sus. + E3{1}	11588	2262		4.47	(16) OCC	24.83	141.48
Sus. + E4{1}	11588	2262		4.47	(16) OCC	24.83	141.48
Sus. + W1{1}	11588	1947		4.47	(16) OCC	24.43	141.48
Sus. + W2{1}	11588	1947		4.47	(16) OCC	24.43	141.48
Sus. + W3{1}	11588	2215		4.47	(16) OCC	24.77	141.48
Sus. + W4{1}	11588	2215		4.47	(16) OCC	24.77	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type		
A04 N+ Max P{1}						( 3) HOOP	21.30	117.90
GR + Max P{1}		6702			4.47	(15) SUST	15.75	117.90
TR:Amb to T1{1}				2865	4.47	(17) DISP	4.85	176.85
Amb to T1{1}				2865	4.47	(17) DISP	4.85	176.85
Sus. + E1{1}		6702	5578		4.47	(16) OCC	22.84	141.48
Sus. + E2{1}		6702	5578		4.47	(16) OCC	22.84	141.48
Sus. + E3{1}		6702	2936		4.47	(16) OCC	19.48	141.48
Sus. + E4{1}		6702	2936		4.47	(16) OCC	19.48	141.48
Sus. + W1{1}		6702	6157		4.47	(16) OCC	23.57	141.48
Sus. + W2{1}		6702	6157		4.47	(16) OCC	23.57	141.48
Sus. + W3{1}		6702	2560		4.47	(16) OCC	19.00	141.48
Sus. + W4{1}		6702	2560		4.47	(16) OCC	19.00	141.48
A05 F- Max P{1}						( 3) HOOP	21.30	117.90
GR + Max P{1}		6861			4.47	(15) SUST	15.95	117.90
TR:Amb to T1{1}				2732	4.47	(17) DISP	4.63	176.85
Amb to T1{1}				2732	4.47	(17) DISP	4.63	176.85
Sus. + E1{1}		6861	5425		4.47	(16) OCC	22.85	141.48
Sus. + E2{1}		6861	5425		4.47	(16) OCC	22.85	141.48
Sus. + E3{1}		6861	2455		4.47	(16) OCC	19.07	141.48
Sus. + E4{1}		6861	2455		4.47	(16) OCC	19.07	141.48
Sus. + W1{1}		6861	5995		4.47	(16) OCC	23.57	141.48
Sus. + W2{1}		6861	5995		4.47	(16) OCC	23.57	141.48
Sus. + W3{1}		6861	1930		4.47	(16) OCC	18.40	141.48
Sus. + W4{1}		6861	1930		4.47	(16) OCC	18.40	141.48
A08 + Max P{1}						( 3) HOOP	21.30	117.90
GR + Max P{1}		10245			1.00	(15) SUST	11.12	117.90
TR:Amb to T1{1}				1903	1.00	(17) DISP	0.72	176.85
Amb to T1{1}				1903	1.00	(17) DISP	0.72	176.85
Sus. + E1{1}		10245	19370		1.00	(16) OCC	18.46	141.48
Sus. + E2{1}		10245	19370		1.00	(16) OCC	18.46	141.48
Sus. + E3{1}		10245	14260		1.00	(16) OCC	16.52	141.48
Sus. + E4{1}		10245	14260		1.00	(16) OCC	16.52	141.48
Sus. + W1{1}		10245	31582		1.00	(16) OCC	23.08	141.48
Sus. + W2{1}		10245	31582		1.00	(16) OCC	23.08	141.48
Sus. + W3{1}		10245	17188		1.00	(16) OCC	17.63	141.48
Sus. + W4{1}		10245	17188		1.00	(16) OCC	17.63	141.48
A08 - Max P{1}						( 3) HOOP	21.30	117.90
GR + Max P{1}		10245			1.00	(15) SUST	11.12	117.90
TR:Amb to T1{1}				1903	1.00	(17) DISP	0.72	176.85
Amb to T1{1}				1903	1.00	(17) DISP	0.72	176.85
Sus. + E1{1}		10245	19370		1.00	(16) OCC	18.46	141.48
Sus. + E2{1}		10245	19370		1.00	(16) OCC	18.46	141.48
Sus. + E3{1}		10245	14260		1.00	(16) OCC	16.52	141.48
Sus. + E4{1}		10245	14260		1.00	(16) OCC	16.52	141.48
Sus. + W1{1}		10245	31582		1.00	(16) OCC	23.08	141.48



Sus. + W2{1}	10245	31582	1.00	(16)	OCC	23.08	141.48
Sus. + W3{1}	10245	17188	1.00	(16)	OCC	17.63	141.48
Sus. + W4{1}	10245	17188	1.00	(16)	OCC	17.63	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Moments in N.m )		(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type		
A05 N+	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	6928			4.47	(15)	SUST	16.04	117.90
	TR:Amb to T1{1}			2743	4.47	(17)	DISP	4.65	176.85
	Amb to T1{1}			2743	4.47	(17)	DISP	4.65	176.85
	Sus. + E1{1}	6928	4323		4.47	(16)	OCC	21.53	141.48
	Sus. + E2{1}	6928	4323		4.47	(16)	OCC	21.53	141.48
	Sus. + E3{1}	6928	2861		4.47	(16)	OCC	19.67	141.48
	Sus. + E4{1}	6928	2861		4.47	(16)	OCC	19.67	141.48
	Sus. + W1{1}	6928	4480		4.47	(16)	OCC	21.73	141.48
	Sus. + W2{1}	6928	4480		4.47	(16)	OCC	21.73	141.48
	Sus. + W3{1}	6928	2739		4.47	(16)	OCC	19.52	141.48
	Sus. + W4{1}	6928	2739		4.47	(16)	OCC	19.52	141.48
A15	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	3049			1.00	(15)	SUST	8.39	117.90
	TR:Amb to T1{1}			500	1.00	(17)	DISP	0.19	176.85
	Amb to T1{1}			500	1.00	(17)	DISP	0.19	176.85
	Sus. + E1{1}	3049	10625		1.00	(16)	OCC	12.41	141.48
	Sus. + E2{1}	3049	10625		1.00	(16)	OCC	12.41	141.48
	Sus. + E3{1}	3049	11206		1.00	(16)	OCC	12.64	141.48
	Sus. + E4{1}	3049	11206		1.00	(16)	OCC	12.64	141.48
	Sus. + W1{1}	3049	23323		1.00	(16)	OCC	17.23	141.48
	Sus. + W2{1}	3049	23323		1.00	(16)	OCC	17.23	141.48
	Sus. + W3{1}	3049	18914		1.00	(16)	OCC	15.56	141.48
	Sus. + W4{1}	3049	18914		1.00	(16)	OCC	15.56	141.48
A14 F+	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	4826			1.00	(15)	SUST	9.06	117.90
	TR:Amb to T1{1}			243	1.00	(17)	DISP	0.09	176.85
	Amb to T1{1}			243	1.00	(17)	DISP	0.09	176.85
	Sus. + E1{1}	4826	5636		1.00	(16)	OCC	11.20	141.48
	Sus. + E2{1}	4826	5636		1.00	(16)	OCC	11.20	141.48
	Sus. + E3{1}	4826	2744		1.00	(16)	OCC	10.10	141.48
	Sus. + E4{1}	4826	2744		1.00	(16)	OCC	10.10	141.48
	Sus. + W1{1}	4826	10391		1.00	(16)	OCC	13.00	141.48
	Sus. + W2{1}	4826	10391		1.00	(16)	OCC	13.00	141.48
	Sus. + W3{1}	4826	5007		1.00	(16)	OCC	10.96	141.48
	Sus. + W4{1}	4826	5007		1.00	(16)	OCC	10.96	141.48
A14 N+	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	1832			4.47	(15)	SUST	9.56	117.90
	TR:Amb to T1{1}			188	4.47	(17)	DISP	0.32	176.85
	Amb to T1{1}			188	4.47	(17)	DISP	0.32	176.85
	Sus. + E1{1}	1832	4467		4.47	(16)	OCC	15.24	141.48
	Sus. + E2{1}	1832	4467		4.47	(16)	OCC	15.24	141.48
	Sus. + E3{1}	1832	2075		4.47	(16)	OCC	12.20	141.48
	Sus. + E4{1}	1832	2075		4.47	(16)	OCC	12.20	141.48
	Sus. + W1{1}	1832	7389		4.47	(16)	OCC	18.95	141.48
	Sus. + W2{1}	1832	7389		4.47	(16)	OCC	18.95	141.48
	Sus. + W3{1}	1832	4025		4.47	(16)	OCC	14.68	141.48
	Sus. + W4{1}	1832	4025		4.47	(16)	OCC	14.68	141.48

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		ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm2 )			
Point	Load	(Moments in N.m )						
name	combination	Ma	Mb	Mc	S.I.F	Eq. Load	Code	Code
		(Sus.)	(Occ.)	(Exp.)		no. type	Stress	Allow.
A14 N-	Max P{1}					( 3) HOOP	21.30	117.90
	GR + Max P{1}	1832			1.00	(15) SUST	7.93	117.90
	TR:Amb to T1{1}			188	1.00	(17) DISP	0.07	176.85
	Amb to T1{1}			188	1.00	(17) DISP	0.07	176.85
	Sus. + E1{1}	1832	4467		1.00	(16) OCC	9.62	141.48
	Sus. + E2{1}	1832	4467		1.00	(16) OCC	9.62	141.48
	Sus. + E3{1}	1832	2075		1.00	(16) OCC	8.71	141.48
	Sus. + E4{1}	1832	2075		1.00	(16) OCC	8.71	141.48
	Sus. + W1{1}	1832	7389		1.00	(16) OCC	10.73	141.48
	Sus. + W2{1}	1832	7389		1.00	(16) OCC	10.73	141.48
	Sus. + W3{1}	1832	4025		1.00	(16) OCC	9.45	141.48
	Sus. + W4{1}	1832	4025		1.00	(16) OCC	9.45	141.48
A13 F+	Max P{1}					( 3) HOOP	21.30	117.90
	GR + Max P{1}	5019			1.00	(15) SUST	9.13	117.90
	TR:Amb to T1{1}			444	1.00	(17) DISP	0.17	176.85
	Amb to T1{1}			444	1.00	(17) DISP	0.17	176.85
	Sus. + E1{1}	5019	2800		1.00	(16) OCC	10.20	141.48
	Sus. + E2{1}	5019	2800		1.00	(16) OCC	10.20	141.48
	Sus. + E3{1}	5019	1263		1.00	(16) OCC	9.61	141.48
	Sus. + E4{1}	5019	1263		1.00	(16) OCC	9.61	141.48
	Sus. + W1{1}	5019	5707		1.00	(16) OCC	11.30	141.48
	Sus. + W2{1}	5019	5707		1.00	(16) OCC	11.30	141.48
	Sus. + W3{1}	5019	2235		1.00	(16) OCC	9.98	141.48
	Sus. + W4{1}	5019	2235		1.00	(16) OCC	9.98	141.48
A13 F-	Max P{1}					( 3) HOOP	21.30	117.90
	GR + Max P{1}	5019			4.47	(15) SUST	13.61	117.90
	TR:Amb to T1{1}			444	4.47	(17) DISP	0.75	176.85
	Amb to T1{1}			444	4.47	(17) DISP	0.75	176.85
	Sus. + E1{1}	5019	2800		4.47	(16) OCC	17.17	141.48
	Sus. + E2{1}	5019	2800		4.47	(16) OCC	17.17	141.48
	Sus. + E3{1}	5019	1263		4.47	(16) OCC	15.22	141.48
	Sus. + E4{1}	5019	1263		4.47	(16) OCC	15.22	141.48
	Sus. + W1{1}	5019	5707		4.47	(16) OCC	20.86	141.48
	Sus. + W2{1}	5019	5707		4.47	(16) OCC	20.86	141.48
	Sus. + W3{1}	5019	2235		4.47	(16) OCC	16.45	141.48
	Sus. + W4{1}	5019	2235		4.47	(16) OCC	16.45	141.48
A13 N+	Max P{1}					( 3) HOOP	21.30	117.90
	GR + Max P{1}	2917			4.47	(15) SUST	10.94	117.90
	TR:Amb to T1{1}			528	4.47	(17) DISP	0.89	176.85
	Amb to T1{1}			528	4.47	(17) DISP	0.89	176.85
	Sus. + E1{1}	2917	3506		4.47	(16) OCC	15.40	141.48
	Sus. + E2{1}	2917	3506		4.47	(16) OCC	15.40	141.48
	Sus. + E3{1}	2917	1706		4.47	(16) OCC	13.11	141.48
	Sus. + E4{1}	2917	1706		4.47	(16) OCC	13.11	141.48
	Sus. + W1{1}	2917	7971		4.47	(16) OCC	21.07	141.48
	Sus. + W2{1}	2917	7971		4.47	(16) OCC	21.07	141.48
	Sus. + W3{1}	2917	3311		4.47	(16) OCC	15.15	141.48
	Sus. + W4{1}	2917	3311		4.47	(16) OCC	15.15	141.48

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		ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm2 )			
Point	Load	(Moments in N.m )						
name	combination	Ma	Mb	Mc	S.I.F	Eq. Load	Code	Code
		(Sus.)	(Occ.)	(Exp.)		no. type	Stress	Allow.
A13 N-	Max P{1}					( 3) HOOP	21.30	117.90
	GR + Max P{1}	2917			1.00	(15) SUST	8.34	117.90

TR:Amb to T1{1}			528	1.00	(17)	DISP	0.20	176.85
Amb to T1{1}			528	1.00	(17)	DISP	0.20	176.85
Sus. + E1{1}	2917	3506		1.00	(16)	OCC	9.67	141.48
Sus. + E2{1}	2917	3506		1.00	(16)	OCC	9.67	141.48
Sus. + E3{1}	2917	1706		1.00	(16)	OCC	8.99	141.48
Sus. + E4{1}	2917	1706		1.00	(16)	OCC	8.99	141.48
Sus. + W1{1}	2917	7971		1.00	(16)	OCC	11.36	141.48
Sus. + W2{1}	2917	7971		1.00	(16)	OCC	11.36	141.48
Sus. + W3{1}	2917	3311		1.00	(16)	OCC	9.59	141.48
Sus. + W4{1}	2917	3311		1.00	(16)	OCC	9.59	141.48
A12 + Max P{1}								
GR + Max P{1}	10800			1.00	(15)	SUST	11.33	117.90
TR:Amb to T1{1}			909	1.00	(17)	DISP	0.34	176.85
Amb to T1{1}			909	1.00	(17)	DISP	0.34	176.85
Sus. + E1{1}	10800	2634		1.00	(16)	OCC	12.32	141.48
Sus. + E2{1}	10800	2634		1.00	(16)	OCC	12.32	141.48
Sus. + E3{1}	10800	2846		1.00	(16)	OCC	12.40	141.48
Sus. + E4{1}	10800	2846		1.00	(16)	OCC	12.40	141.48
Sus. + W1{1}	10800	5954		1.00	(16)	OCC	13.58	141.48
Sus. + W2{1}	10800	5954		1.00	(16)	OCC	13.58	141.48
Sus. + W3{1}	10800	3722		1.00	(16)	OCC	12.74	141.48
Sus. + W4{1}	10800	3722		1.00	(16)	OCC	12.74	141.48
A12 - Max P{1}								
GR + Max P{1}	10800			1.00	(15)	SUST	11.33	117.90
TR:Amb to T1{1}			909	1.00	(17)	DISP	0.34	176.85
Amb to T1{1}			909	1.00	(17)	DISP	0.34	176.85
Sus. + E1{1}	10800	2634		1.00	(16)	OCC	12.32	141.48
Sus. + E2{1}	10800	2634		1.00	(16)	OCC	12.32	141.48
Sus. + E3{1}	10800	2846		1.00	(16)	OCC	12.40	141.48
Sus. + E4{1}	10800	2846		1.00	(16)	OCC	12.40	141.48
Sus. + W1{1}	10800	5954		1.00	(16)	OCC	13.58	141.48
Sus. + W2{1}	10800	5954		1.00	(16)	OCC	13.58	141.48
Sus. + W3{1}	10800	3722		1.00	(16)	OCC	12.74	141.48
Sus. + W4{1}	10800	3722		1.00	(16)	OCC	12.74	141.48
All F+ Max P{1}								
GR + Max P{1}	10511			1.00	(15)	SUST	11.22	117.90
TR:Amb to T1{1}			899	1.00	(17)	DISP	0.34	176.85
Amb to T1{1}			899	1.00	(17)	DISP	0.34	176.85
Sus. + E1{1}	10511	2469		1.00	(16)	OCC	12.15	141.48
Sus. + E2{1}	10511	2469		1.00	(16)	OCC	12.15	141.48
Sus. + E3{1}	10511	2642		1.00	(16)	OCC	12.22	141.48
Sus. + E4{1}	10511	2642		1.00	(16)	OCC	12.22	141.48
Sus. + W1{1}	10511	5754		1.00	(16)	OCC	13.40	141.48
Sus. + W2{1}	10511	5754		1.00	(16)	OCC	13.40	141.48
Sus. + W3{1}	10511	3543		1.00	(16)	OCC	12.56	141.48
Sus. + W4{1}	10511	3543		1.00	(16)	OCC	12.56	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			(Stress in N/mm <sup>2</sup> )		Code Stress	Code Allow.
		(Moments in N.m)		S.I.F	Eq. Load no. type			
		Ma (Sus.)	Mb (Occ.)			Mc (Exp.)		
All N+	Max P{1}					( 3) HOOP	21.30	117.90
	GR + Max P{1}	7252			4.47	(15) SUST	16.45	117.90
	TR:Amb to T1{1}			940	4.47	(17) DISP	1.59	176.85
	Amb to T1{1}			940	4.47	(17) DISP	1.59	176.85
	Sus. + E1{1}	7252	1070		4.47	(16) OCC	17.81	141.48
	Sus. + E2{1}	7252	1070		4.47	(16) OCC	17.81	141.48
	Sus. + E3{1}	7252	885		4.47	(16) OCC	17.57	141.48
	Sus. + E4{1}	7252	885		4.47	(16) OCC	17.57	141.48
	Sus. + W1{1}	7252	2328		4.47	(16) OCC	19.41	141.48
	Sus. + W2{1}	7252	2328		4.47	(16) OCC	19.41	141.48
	Sus. + W3{1}	7252	1678		4.47	(16) OCC	18.58	141.48
	Sus. + W4{1}	7252	1678		4.47	(16) OCC	18.58	141.48
All N-	Max P{1}					( 3) HOOP	21.30	117.90
	GR + Max P{1}	7252			1.00	(15) SUST	9.98	117.90
	TR:Amb to T1{1}			940	1.00	(17) DISP	0.36	176.85
	Amb to T1{1}			940	1.00	(17) DISP	0.36	176.85
	Sus. + E1{1}	7252	1070		1.00	(16) OCC	10.39	141.48
	Sus. + E2{1}	7252	1070		1.00	(16) OCC	10.39	141.48

	Sus. + E3{1}	7252	885		1.00	(16)	OCC	10.32	141.48
	Sus. + E4{1}	7252	885		1.00	(16)	OCC	10.32	141.48
	Sus. + W1{1}	7252	2328		1.00	(16)	OCC	10.86	141.48
	Sus. + W2{1}	7252	2328		1.00	(16)	OCC	10.86	141.48
	Sus. + W3{1}	7252	1678		1.00	(16)	OCC	10.62	141.48
	Sus. + W4{1}	7252	1678		1.00	(16)	OCC	10.62	141.48
A09 F+	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	22722			1.00	(15)	SUST	15.84	117.90
	TR:Amb to T1{1}			1216	1.00	(17)	DISP	0.46	176.85
	Amb to T1{1}			1216	1.00	(17)	DISP	0.46	176.85
	Sus. + E1{1}	22722	1586		1.00	(16)	OCC	16.44	141.48
	Sus. + E2{1}	22722	1586		1.00	(16)	OCC	16.44	141.48
	Sus. + E3{1}	22722	1999		1.00	(16)	OCC	16.60	141.48
	Sus. + E4{1}	22722	1999		1.00	(16)	OCC	16.60	141.48
	Sus. + W1{1}	22722	2388		1.00	(16)	OCC	16.75	141.48
	Sus. + W2{1}	22722	2388		1.00	(16)	OCC	16.75	141.48
	Sus. + W3{1}	22722	1782		1.00	(16)	OCC	16.52	141.48
	Sus. + W4{1}	22722	1782		1.00	(16)	OCC	16.52	141.48
A09 N-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	11588			1.00	(15)	SUST	11.62	117.90
	TR:Amb to T1{1}			1293	1.00	(17)	DISP	0.49	176.85
	Amb to T1{1}			1293	1.00	(17)	DISP	0.49	176.85
	Sus. + E1{1}	11588	2090		1.00	(16)	OCC	12.42	141.48
	Sus. + E2{1}	11588	2090		1.00	(16)	OCC	12.42	141.48
	Sus. + E3{1}	11588	2262		1.00	(16)	OCC	12.48	141.48
	Sus. + E4{1}	11588	2262		1.00	(16)	OCC	12.48	141.48
	Sus. + W1{1}	11588	1947		1.00	(16)	OCC	12.36	141.48
	Sus. + W2{1}	11588	1947		1.00	(16)	OCC	12.36	141.48
	Sus. + W3{1}	11588	2215		1.00	(16)	OCC	12.46	141.48
	Sus. + W4{1}	11588	2215		1.00	(16)	OCC	12.46	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
		(Moments in N.m )			(Stress in N/mm2 )				
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	Code type	Code Stress	Code Allow.
A07 F+	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	14983			1.00	(15)	SUST	12.91	117.90
	TR:Amb to T1{1}			1909	1.00	(17)	DISP	0.72	176.85
	Amb to T1{1}			1909	1.00	(17)	DISP	0.72	176.85
	Sus. + E1{1}	14983	1132		1.00	(16)	OCC	13.34	141.48
	Sus. + E2{1}	14983	1132		1.00	(16)	OCC	13.34	141.48
	Sus. + E3{1}	14983	3141		1.00	(16)	OCC	14.10	141.48
	Sus. + E4{1}	14983	3141		1.00	(16)	OCC	14.10	141.48
	Sus. + W1{1}	14983	3306		1.00	(16)	OCC	14.16	141.48
	Sus. + W2{1}	14983	3306		1.00	(16)	OCC	14.16	141.48
	Sus. + W3{1}	14983	2959		1.00	(16)	OCC	14.03	141.48
	Sus. + W4{1}	14983	2959		1.00	(16)	OCC	14.03	141.48
A07 N-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	14355			1.00	(15)	SUST	12.67	117.90
	TR:Amb to T1{1}			1949	1.00	(17)	DISP	0.74	176.85
	Amb to T1{1}			1949	1.00	(17)	DISP	0.74	176.85
	Sus. + E1{1}	14355	1306		1.00	(16)	OCC	13.17	141.48
	Sus. + E2{1}	14355	1306		1.00	(16)	OCC	13.17	141.48
	Sus. + E3{1}	14355	3257		1.00	(16)	OCC	13.91	141.48
	Sus. + E4{1}	14355	3257		1.00	(16)	OCC	13.91	141.48
	Sus. + W1{1}	14355	2404		1.00	(16)	OCC	13.58	141.48
	Sus. + W2{1}	14355	2404		1.00	(16)	OCC	13.58	141.48
	Sus. + W3{1}	14355	3160		1.00	(16)	OCC	13.87	141.48
	Sus. + W4{1}	14355	3160		1.00	(16)	OCC	13.87	141.48
A06 F+	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	12209			1.00	(15)	SUST	11.86	117.90
	TR:Amb to T1{1}			1789	1.00	(17)	DISP	0.68	176.85
	Amb to T1{1}			1789	1.00	(17)	DISP	0.68	176.85
	Sus. + E1{1}	12209	4393		1.00	(16)	OCC	13.52	141.48
	Sus. + E2{1}	12209	4393		1.00	(16)	OCC	13.52	141.48
	Sus. + E3{1}	12209	3616		1.00	(16)	OCC	13.23	141.48
	Sus. + E4{1}	12209	3616		1.00	(16)	OCC	13.23	141.48
	Sus. + W1{1}	12209	5011		1.00	(16)	OCC	13.76	141.48
	Sus. + W2{1}	12209	5011		1.00	(16)	OCC	13.76	141.48

	Sus. + W3{1}	12209	4044		1.00	(16)	OCC	13.39	141.48
	Sus. + W4{1}	12209	4044		1.00	(16)	OCC	13.39	141.48
A06 N-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	12143			1.00	(15)	SUST	11.83	117.90
	TR:Amb to T1{1}			1826	1.00	(17)	DISP	0.69	176.85
	Amb to T1{1}			1826	1.00	(17)	DISP	0.69	176.85
	Sus. + E1{1}	12143	4511		1.00	(16)	OCC	13.54	141.48
	Sus. + E2{1}	12143	4511		1.00	(16)	OCC	13.54	141.48
	Sus. + E3{1}	12143	3558		1.00	(16)	OCC	13.18	141.48
	Sus. + E4{1}	12143	3558		1.00	(16)	OCC	13.18	141.48
	Sus. + W1{1}	12143	5198		1.00	(16)	OCC	13.80	141.48
	Sus. + W2{1}	12143	5198		1.00	(16)	OCC	13.80	141.48
	Sus. + W3{1}	12143	3966		1.00	(16)	OCC	13.34	141.48
	Sus. + W4{1}	12143	3966		1.00	(16)	OCC	13.34	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A05 F+	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	6861			1.00	(15)	SUST	9.83	117.90
	TR:Amb to T1{1}			2732	1.00	(17)	DISP	1.04	176.85
	Amb to T1{1}			2732	1.00	(17)	DISP	1.04	176.85
	Sus. + E1{1}	6861	5425		1.00	(16)	OCC	11.89	141.48
	Sus. + E2{1}	6861	5425		1.00	(16)	OCC	11.89	141.48
	Sus. + E3{1}	6861	2455		1.00	(16)	OCC	10.76	141.48
	Sus. + E4{1}	6861	2455		1.00	(16)	OCC	10.76	141.48
	Sus. + W1{1}	6861	5995		1.00	(16)	OCC	12.10	141.48
	Sus. + W2{1}	6861	5995		1.00	(16)	OCC	12.10	141.48
	Sus. + W3{1}	6861	1930		1.00	(16)	OCC	10.56	141.48
	Sus. + W4{1}	6861	1930		1.00	(16)	OCC	10.56	141.48
A05 N-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	6928			1.00	(15)	SUST	9.86	117.90
	TR:Amb to T1{1}			2743	1.00	(17)	DISP	1.04	176.85
	Amb to T1{1}			2743	1.00	(17)	DISP	1.04	176.85
	Sus. + E1{1}	6928	4323		1.00	(16)	OCC	11.50	141.48
	Sus. + E2{1}	6928	4323		1.00	(16)	OCC	11.50	141.48
	Sus. + E3{1}	6928	2861		1.00	(16)	OCC	10.94	141.48
	Sus. + E4{1}	6928	2861		1.00	(16)	OCC	10.94	141.48
	Sus. + W1{1}	6928	4480		1.00	(16)	OCC	11.56	141.48
	Sus. + W2{1}	6928	4480		1.00	(16)	OCC	11.56	141.48
	Sus. + W3{1}	6928	2739		1.00	(16)	OCC	10.90	141.48
	Sus. + W4{1}	6928	2739		1.00	(16)	OCC	10.90	141.48
A04 F+	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	6393			1.00	(15)	SUST	9.66	117.90
	TR:Amb to T1{1}			2273	1.00	(17)	DISP	0.86	176.85
	Amb to T1{1}			2273	1.00	(17)	DISP	0.86	176.85
	Sus. + E1{1}	6393	3488		1.00	(16)	OCC	10.98	141.48
	Sus. + E2{1}	6393	3488		1.00	(16)	OCC	10.98	141.48
	Sus. + E3{1}	6393	3706		1.00	(16)	OCC	11.06	141.48
	Sus. + E4{1}	6393	3706		1.00	(16)	OCC	11.06	141.48
	Sus. + W1{1}	6393	3487		1.00	(16)	OCC	10.98	141.48
	Sus. + W2{1}	6393	3487		1.00	(16)	OCC	10.98	141.48
	Sus. + W3{1}	6393	3343		1.00	(16)	OCC	10.92	141.48
	Sus. + W4{1}	6393	3343		1.00	(16)	OCC	10.92	141.48
A04 F-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	6393			4.47	(15)	SUST	15.36	117.90
	TR:Amb to T1{1}			2273	4.47	(17)	DISP	3.85	176.85
	Amb to T1{1}			2273	4.47	(17)	DISP	3.85	176.85
	Sus. + E1{1}	6393	3488		4.47	(16)	OCC	19.79	141.48
	Sus. + E2{1}	6393	3488		4.47	(16)	OCC	19.79	141.48
	Sus. + E3{1}	6393	3706		4.47	(16)	OCC	20.07	141.48
	Sus. + E4{1}	6393	3706		4.47	(16)	OCC	20.07	141.48
	Sus. + W1{1}	6393	3487		4.47	(16)	OCC	19.79	141.48
	Sus. + W2{1}	6393	3487		4.47	(16)	OCC	19.79	141.48
	Sus. + W3{1}	6393	3343		4.47	(16)	OCC	19.61	141.48
	Sus. + W4{1}	6393	3343		4.47	(16)	OCC	19.61	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A04 N-	Max P{1}					( 3) HOOP	21.30	117.90
	GR + Max P{1}	6702			1.00	(15) SUST	9.77	117.90
	TR:Amb to T1{1}			2865	1.00	(17) DISP	1.09	176.85
	Amb to T1{1}			2865	1.00	(17) DISP	1.09	176.85
	Sus. + E1{1}	6702	5578		1.00	(16) OCC	11.89	141.48
	Sus. + E2{1}	6702	5578		1.00	(16) OCC	11.89	141.48
	Sus. + E3{1}	6702	2936		1.00	(16) OCC	10.89	141.48
	Sus. + E4{1}	6702	2936		1.00	(16) OCC	10.89	141.48
	Sus. + W1{1}	6702	6157		1.00	(16) OCC	12.11	141.48
	Sus. + W2{1}	6702	6157		1.00	(16) OCC	12.11	141.48
	Sus. + W3{1}	6702	2560		1.00	(16) OCC	10.74	141.48
	Sus. + W4{1}	6702	2560		1.00	(16) OCC	10.74	141.48
A03 +	Max P{1}					( 3) HOOP	21.30	117.90
	GR + Max P{1}	17947			1.00	(15) SUST	14.03	117.90
	TR:Amb to T1{1}			4230	1.00	(17) DISP	1.60	176.85
	Amb to T1{1}			4230	1.00	(17) DISP	1.60	176.85
	Sus. + E1{1}	17947	7541		1.00	(16) OCC	16.89	141.48
	Sus. + E2{1}	17947	7541		1.00	(16) OCC	16.89	141.48
	Sus. + E3{1}	17947	8857		1.00	(16) OCC	17.39	141.48
	Sus. + E4{1}	17947	8857		1.00	(16) OCC	17.39	141.48
	Sus. + W1{1}	17947	7316		1.00	(16) OCC	16.81	141.48
	Sus. + W2{1}	17947	7316		1.00	(16) OCC	16.81	141.48
	Sus. + W3{1}	17947	8352		1.00	(16) OCC	17.20	141.48
	Sus. + W4{1}	17947	8352		1.00	(16) OCC	17.20	141.48
A03 -	Max P{1}					( 3) HOOP	21.30	117.90
	GR + Max P{1}	17947			1.00	(15) SUST	14.03	117.90
	TR:Amb to T1{1}			4230	1.00	(17) DISP	1.60	176.85
	Amb to T1{1}			4230	1.00	(17) DISP	1.60	176.85
	Sus. + E1{1}	17947	7541		1.00	(16) OCC	16.89	141.48
	Sus. + E2{1}	17947	7541		1.00	(16) OCC	16.89	141.48
	Sus. + E3{1}	17947	8857		1.00	(16) OCC	17.39	141.48
	Sus. + E4{1}	17947	8857		1.00	(16) OCC	17.39	141.48
	Sus. + W1{1}	17947	7316		1.00	(16) OCC	16.81	141.48
	Sus. + W2{1}	17947	7316		1.00	(16) OCC	16.81	141.48
	Sus. + W3{1}	17947	8352		1.00	(16) OCC	17.20	141.48
	Sus. + W4{1}	17947	8352		1.00	(16) OCC	17.20	141.48
A02 F+	Max P{1}					( 3) HOOP	21.30	117.90
	GR + Max P{1}	10240			1.00	(15) SUST	11.11	117.90
	TR:Amb to T1{1}			2208	1.00	(17) DISP	0.84	176.85
	Amb to T1{1}			2208	1.00	(17) DISP	0.84	176.85
	Sus. + E1{1}	10240	8051		1.00	(16) OCC	14.16	141.48
	Sus. + E2{1}	10240	8051		1.00	(16) OCC	14.16	141.48
	Sus. + E3{1}	10240	5900		1.00	(16) OCC	13.35	141.48
	Sus. + E4{1}	10240	5900		1.00	(16) OCC	13.35	141.48
	Sus. + W1{1}	10240	7357		1.00	(16) OCC	13.90	141.48
	Sus. + W2{1}	10240	7357		1.00	(16) OCC	13.90	141.48
	Sus. + W3{1}	10240	5130		1.00	(16) OCC	13.06	141.48
	Sus. + W4{1}	10240	5130		1.00	(16) OCC	13.06	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE			S.I.F	Eq. Load no. type	Code Stress	Code Allow.
		(Moments in N.m ) Ma (Sus.)	Mb (Occ.)	Mc (Exp.)				
A02 N+	Max P{1}					( 3) HOOP	21.30	117.90
	GR + Max P{1}	4544			4.47	(15) SUST	13.01	117.90

TR:Amb to T1{1}			1873	4.47	(17)	DISP	3.17	176.85
Amb to T1{1}			1873	4.47	(17)	DISP	3.17	176.85
Sus. + E1{1}	4544	4439		4.47	(16)	OCC	18.65	141.48
Sus. + E2{1}	4544	4439		4.47	(16)	OCC	18.65	141.48
Sus. + E3{1}	4544	3555		4.47	(16)	OCC	17.52	141.48
Sus. + E4{1}	4544	3555		4.47	(16)	OCC	17.52	141.48
Sus. + W1{1}	4544	3789		4.47	(16)	OCC	17.82	141.48
Sus. + W2{1}	4544	3789		4.47	(16)	OCC	17.82	141.48
Sus. + W3{1}	4544	2823		4.47	(16)	OCC	16.59	141.48
Sus. + W4{1}	4544	2823		4.47	(16)	OCC	16.59	141.48
A02 N-								
Max P{1}					( 3)	HOOP	21.30	117.90
GR + Max P{1}	4544			1.00	(15)	SUST	8.96	117.90
TR:Amb to T1{1}			1873	1.00	(17)	DISP	0.71	176.85
Amb to T1{1}			1873	1.00	(17)	DISP	0.71	176.85
Sus. + E1{1}	4544	4439		1.00	(16)	OCC	10.64	141.48
Sus. + E2{1}	4544	4439		1.00	(16)	OCC	10.64	141.48
Sus. + E3{1}	4544	3555		1.00	(16)	OCC	10.30	141.48
Sus. + E4{1}	4544	3555		1.00	(16)	OCC	10.30	141.48
Sus. + W1{1}	4544	3789		1.00	(16)	OCC	10.39	141.48
Sus. + W2{1}	4544	3789		1.00	(16)	OCC	10.39	141.48
Sus. + W3{1}	4544	2823		1.00	(16)	OCC	10.02	141.48
Sus. + W4{1}	4544	2823		1.00	(16)	OCC	10.02	141.48
A01								
Max P{1}					( 3)	HOOP	21.30	117.90
GR + Max P{1}	3665			1.00	(15)	SUST	8.62	117.90
TR:Amb to T1{1}			1851	1.00	(17)	DISP	0.70	176.85
Amb to T1{1}			1851	1.00	(17)	DISP	0.70	176.85
Sus. + E1{1}	3665	2015		1.00	(16)	OCC	9.39	141.48
Sus. + E2{1}	3665	2015		1.00	(16)	OCC	9.39	141.48
Sus. + E3{1}	3665	3378		1.00	(16)	OCC	9.90	141.48
Sus. + E4{1}	3665	3378		1.00	(16)	OCC	9.90	141.48
Sus. + W1{1}	3665	1182		1.00	(16)	OCC	9.07	141.48
Sus. + W2{1}	3665	1182		1.00	(16)	OCC	9.07	141.48
Sus. + W3{1}	3665	2674		1.00	(16)	OCC	9.64	141.48
Sus. + W4{1}	3665	2674		1.00	(16)	OCC	9.64	141.48

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R E S U L T     S U M M A R Y  
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Maximum sustained stress ratio

Point : A07 F  
Stress N/mm2 : 43.45  
Allowable N/mm2 : 117.90  
Ratio : 0.37  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A07 N  
Stress N/mm2 : 6.28  
Allowable N/mm2 : 176.85  
Ratio : 0.04  
Load combination : Max Range

Maximum occasional stress ratio

Point : A07 F  
Stress N/mm2 : 51.44  
Allowable N/mm2 : 141.48  
Ratio : 0.36  
Load combination : Sus. + W1{1}

Maximum hoop stress ratio

Point : A07 F  
Stress N/mm2 : 21.30  
Allowable N/mm2 : 117.90  
Ratio : 0.18  
Load combination : Max P{1}

**LAMPIRAN P**  
*GENERAL PIPE STRESS REPORT (OPERATING CONDITION  
WITHOUT EXPANSION JOINT, PIPE THICKNESS = 7,989 mm)*



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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A02 N+	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	6776			4.47		(15) SUST	15.84	117.90
	TR:Amb to T1{1}			52690	4.47		(17) DISP	89.28	176.85
	Amb to T1{1}			52690	4.47		(17) DISP	89.28	176.85
	Sus. + E1{1}	6776	2900		4.47		(16) OCC	19.53	141.48
	Sus. + E2{1}	6776	2900		4.47		(16) OCC	19.53	141.48
	Sus. + E3{1}	6776	3575		4.47		(16) OCC	20.39	141.48
	Sus. + E4{1}	6776	3575		4.47		(16) OCC	20.39	141.48
	Sus. + W1{1}	6776	3004		4.47		(16) OCC	19.66	141.48
	Sus. + W2{1}	6776	3004		4.47		(16) OCC	19.66	141.48
	Sus. + W3{1}	6776	3220		4.47		(16) OCC	19.94	141.48
	Sus. + W4{1}	6776	3220		4.47		(16) OCC	19.94	141.48
A04 N+	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	8792			4.47		(15) SUST	18.41	117.90
	TR:Amb to T1{1}			30643	4.47		(17) DISP	51.92	176.85
	Amb to T1{1}			30643	4.47		(17) DISP	51.92	176.85
	Sus. + E1{1}	8792	4945		4.47		(16) OCC	24.69	141.48
	Sus. + E2{1}	8792	4945		4.47		(16) OCC	24.69	141.48
	Sus. + E3{1}	8792	2376		4.47		(16) OCC	21.42	141.48
	Sus. + E4{1}	8792	2376		4.47		(16) OCC	21.42	141.48
	Sus. + W1{1}	8792	6384		4.47		(16) OCC	26.52	141.48
	Sus. + W2{1}	8792	6384		4.47		(16) OCC	26.52	141.48
	Sus. + W3{1}	8792	2032		4.47		(16) OCC	20.99	141.48
	Sus. + W4{1}	8792	2032		4.47		(16) OCC	20.99	141.48
A07 N+	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	10444			8.51		(15) SUST	32.48	117.90
	TR:Amb to T1{1}			15455	8.51		(17) DISP	49.81	176.85
	Amb to T1{1}			15455	8.51		(17) DISP	49.81	176.85
	Sus. + E1{1}	10444	1479		8.51		(16) OCC	36.06	141.48
	Sus. + E2{1}	10444	1479		8.51		(16) OCC	36.06	141.48
	Sus. + E3{1}	10444	2182		8.51		(16) OCC	37.76	141.48
	Sus. + E4{1}	10444	2182		8.51		(16) OCC	37.76	141.48
	Sus. + W1{1}	10444	2540		8.51		(16) OCC	38.62	141.48
	Sus. + W2{1}	10444	2540		8.51		(16) OCC	38.62	141.48
	Sus. + W3{1}	10444	2484		8.51		(16) OCC	38.49	141.48
	Sus. + W4{1}	10444	2484		8.51		(16) OCC	38.49	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A06 N+	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	11997			8.51		(15) SUST	36.24	117.90
	TR:Amb to T1{1}			11142	8.51		(17) DISP	35.91	176.85
	Amb to T1{1}			11142	8.51		(17) DISP	35.91	176.85
	Sus. + E1{1}	11997	4084		8.51		(16) OCC	46.11	141.48
	Sus. + E2{1}	11997	4084		8.51		(16) OCC	46.11	141.48
	Sus. + E3{1}	11997	3112		8.51		(16) OCC	43.76	141.48
	Sus. + E4{1}	11997	3112		8.51		(16) OCC	43.76	141.48
	Sus. + W1{1}	11997	5184		8.51		(16) OCC	48.77	141.48
	Sus. + W2{1}	11997	5184		8.51		(16) OCC	48.77	141.48
	Sus. + W3{1}	11997	3948		8.51		(16) OCC	45.78	141.48
	Sus. + W4{1}	11997	3948		8.51		(16) OCC	45.78	141.48
A06 F-	Max P{1}						( 3) HOOP	21.30	117.90

GR + Max P{1}	12072		8.51	(15)	SUST	36.42	117.90
TR:Amb to T1{1}			10967	8.51	(17)	DISP	35.35 176.85
Amb to T1{1}			10967	8.51	(17)	DISP	35.35 176.85
Sus. + E1{1}	12072	4073	8.51	(16)	OCC	46.26	141.48
Sus. + E2{1}	12072	4073	8.51	(16)	OCC	46.26	141.48
Sus. + E3{1}	12072	3229	8.51	(16)	OCC	44.22	141.48
Sus. + E4{1}	12072	3229	8.51	(16)	OCC	44.22	141.48
Sus. + W1{1}	12072	5092	8.51	(16)	OCC	48.73	141.48
Sus. + W2{1}	12072	5092	8.51	(16)	OCC	48.73	141.48
Sus. + W3{1}	12072	4074	8.51	(16)	OCC	46.26	141.48
Sus. + W4{1}	12072	4074	8.51	(16)	OCC	46.26	141.48
A07 F- Max P{1}							
GR + Max P{1}	11121			( 3)	HOOP	21.30	117.90
TR:Amb to T1{1}			14990	8.51	(15)	SUST	34.12 117.90
Amb to T1{1}			14990	8.51	(17)	DISP	48.32 176.85
Sus. + E1{1}	11121	1597	8.51	(16)	OCC	37.98	141.48
Sus. + E2{1}	11121	1597	8.51	(16)	OCC	37.98	141.48
Sus. + E3{1}	11121	1925	8.51	(16)	OCC	38.77	141.48
Sus. + E4{1}	11121	1925	8.51	(16)	OCC	38.77	141.48
Sus. + W1{1}	11121	3326	8.51	(16)	OCC	42.16	141.48
Sus. + W2{1}	11121	3326	8.51	(16)	OCC	42.16	141.48
Sus. + W3{1}	11121	2181	8.51	(16)	OCC	39.39	141.48
Sus. + W4{1}	11121	2181	8.51	(16)	OCC	39.39	141.48
A02 F- Max P{1}							
GR + Max P{1}	9240			( 3)	HOOP	21.30	117.90
TR:Amb to T1{1}			25452	4.47	(15)	SUST	18.97 117.90
Amb to T1{1}			25452	4.47	(17)	DISP	43.12 176.85
Sus. + E1{1}	9240	2206	4.47	(16)	OCC	21.78	141.48
Sus. + E2{1}	9240	2206	4.47	(16)	OCC	21.78	141.48
Sus. + E3{1}	9240	3685	4.47	(16)	OCC	23.66	141.48
Sus. + E4{1}	9240	3685	4.47	(16)	OCC	23.66	141.48
Sus. + W1{1}	9240	2591	4.47	(16)	OCC	22.27	141.48
Sus. + W2{1}	9240	2591	4.47	(16)	OCC	22.27	141.48
Sus. + W3{1}	9240	3388	4.47	(16)	OCC	23.28	141.48
Sus. + W4{1}	9240	3388	4.47	(16)	OCC	23.28	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A05 F-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	4052			4.47	(15)	SUST	12.38	117.90
	TR:Amb to T1{1}			22644	4.47	(17)	DISP	38.37	176.85
	Amb to T1{1}			22644	4.47	(17)	DISP	38.37	176.85
	Sus. + E1{1}	4052	3766		4.47	(16)	OCC	17.17	141.48
	Sus. + E2{1}	4052	3766		4.47	(16)	OCC	17.17	141.48
	Sus. + E3{1}	4052	885		4.47	(16)	OCC	13.51	141.48
	Sus. + E4{1}	4052	885		4.47	(16)	OCC	13.51	141.48
	Sus. + W1{1}	4052	4949		4.47	(16)	OCC	18.67	141.48
	Sus. + W2{1}	4052	4949		4.47	(16)	OCC	18.67	141.48
	Sus. + W3{1}	4052	880		4.47	(16)	OCC	13.50	141.48
	Sus. + W4{1}	4052	880		4.47	(16)	OCC	13.50	141.48
A09 F- Max P{1}									
	GR + Max P{1}	20783			4.47	(15)	SUST	33.64	117.90
	TR:Amb to T1{1}			6710	4.47	(17)	DISP	11.37	176.85
	Amb to T1{1}			6710	4.47	(17)	DISP	11.37	176.85
	Sus. + E1{1}	20783	604		4.47	(16)	OCC	34.41	141.48
	Sus. + E2{1}	20783	604		4.47	(16)	OCC	34.41	141.48
	Sus. + E3{1}	20783	951		4.47	(16)	OCC	34.85	141.48
	Sus. + E4{1}	20783	951		4.47	(16)	OCC	34.85	141.48
	Sus. + W1{1}	20783	1966		4.47	(16)	OCC	36.14	141.48
	Sus. + W2{1}	20783	1966		4.47	(16)	OCC	36.14	141.48
	Sus. + W3{1}	20783	1053		4.47	(16)	OCC	34.98	141.48
	Sus. + W4{1}	20783	1053		4.47	(16)	OCC	34.98	141.48
A05 N+ Max P{1}									
	GR + Max P{1}	3087			4.47	(15)	SUST	11.16	117.90
	TR:Amb to T1{1}			21215	4.47	(17)	DISP	35.95	176.85
	Amb to T1{1}			21215	4.47	(17)	DISP	35.95	176.85
	Sus. + E1{1}	3087	2526		4.47	(16)	OCC	14.37	141.48

Sus. + E2{1}	3087	2526	4.47	(16)	OCC	14.37	141.48
Sus. + E3{1}	3087	1914	4.47	(16)	OCC	13.59	141.48
Sus. + E4{1}	3087	1914	4.47	(16)	OCC	13.59	141.48
Sus. + W1{1}	3087	3227	4.47	(16)	OCC	15.26	141.48
Sus. + W2{1}	3087	3227	4.47	(16)	OCC	15.26	141.48
Sus. + W3{1}	3087	2413	4.47	(16)	OCC	14.22	141.48
Sus. + W4{1}	3087	2413	4.47	(16)	OCC	14.22	141.48

A04 F- Max P{1}				( 3)	HOOP	21.30	117.90
GR + Max P{1}	3979			4.47	(15) SUST	12.29	117.90
TR:Amb to T1{1}			17849	4.47	(17) DISP	30.24	176.85
Amb to T1{1}			17849	4.47	(17) DISP	30.24	176.85
Sus. + E1{1}	3979	2681		4.47	(16) OCC	15.70	141.48
Sus. + E2{1}	3979	2681		4.47	(16) OCC	15.70	141.48
Sus. + E3{1}	3979	1908		4.47	(16) OCC	14.71	141.48
Sus. + E4{1}	3979	1908		4.47	(16) OCC	14.71	141.48
Sus. + W1{1}	3979	3326		4.47	(16) OCC	16.52	141.48
Sus. + W2{1}	3979	3326		4.47	(16) OCC	16.52	141.48
Sus. + W3{1}	3979	1889		4.47	(16) OCC	14.69	141.48
Sus. + W4{1}	3979	1889		4.47	(16) OCC	14.69	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type		
A10 + Max P{1}						( 3) HOOP	21.30	117.90
GR + Max P{1}		57145			1.00	(15) SUST	28.89	117.90
TR:Amb to T1{1}				10717	1.00	(17) DISP	4.06	176.85
Amb to T1{1}				10717	1.00	(17) DISP	4.06	176.85
Sus. + E1{1}		57145	292		1.00	(16) OCC	29.00	141.48
Sus. + E2{1}		57145	292		1.00	(16) OCC	29.00	141.48
Sus. + E3{1}		57145	875		1.00	(16) OCC	29.22	141.48
Sus. + E4{1}		57145	875		1.00	(16) OCC	29.22	141.48
Sus. + W1{1}		57145	1942		1.00	(16) OCC	29.62	141.48
Sus. + W2{1}		57145	1942		1.00	(16) OCC	29.62	141.48
Sus. + W3{1}		57145	1120		1.00	(16) OCC	29.31	141.48
Sus. + W4{1}		57145	1120		1.00	(16) OCC	29.31	141.48
A10 - Max P{1}						( 3) HOOP	21.30	117.90
GR + Max P{1}		57145			1.00	(15) SUST	28.89	117.90
TR:Amb to T1{1}				10717	1.00	(17) DISP	4.06	176.85
Amb to T1{1}				10717	1.00	(17) DISP	4.06	176.85
Sus. + E1{1}		57145	292		1.00	(16) OCC	29.00	141.48
Sus. + E2{1}		57145	292		1.00	(16) OCC	29.00	141.48
Sus. + E3{1}		57145	875		1.00	(16) OCC	29.22	141.48
Sus. + E4{1}		57145	875		1.00	(16) OCC	29.22	141.48
Sus. + W1{1}		57145	1942		1.00	(16) OCC	29.62	141.48
Sus. + W2{1}		57145	1942		1.00	(16) OCC	29.62	141.48
Sus. + W3{1}		57145	1120		1.00	(16) OCC	29.31	141.48
Sus. + W4{1}		57145	1120		1.00	(16) OCC	29.31	141.48
A11 F- Max P{1}						( 3) HOOP	21.30	117.90
GR + Max P{1}		9384			4.47	(15) SUST	19.16	117.90
TR:Amb to T1{1}				4889	4.47	(17) DISP	8.28	176.85
Amb to T1{1}				4889	4.47	(17) DISP	8.28	176.85
Sus. + E1{1}		9384	2021		4.47	(16) OCC	21.73	141.48
Sus. + E2{1}		9384	2021		4.47	(16) OCC	21.73	141.48
Sus. + E3{1}		9384	2318		4.47	(16) OCC	22.10	141.48
Sus. + E4{1}		9384	2318		4.47	(16) OCC	22.10	141.48
Sus. + W1{1}		9384	5421		4.47	(16) OCC	26.05	141.48
Sus. + W2{1}		9384	5421		4.47	(16) OCC	26.05	141.48
Sus. + W3{1}		9384	2988		4.47	(16) OCC	22.96	141.48
Sus. + W4{1}		9384	2988		4.47	(16) OCC	22.96	141.48
A14 F- Max P{1}						( 3) HOOP	21.30	117.90
GR + Max P{1}		4091			4.47	(15) SUST	12.43	117.90
TR:Amb to T1{1}				2366	4.47	(17) DISP	4.01	176.85
Amb to T1{1}				2366	4.47	(17) DISP	4.01	176.85
Sus. + E1{1}		4091	4818		4.47	(16) OCC	18.55	141.48
Sus. + E2{1}		4091	4818		4.47	(16) OCC	18.55	141.48
Sus. + E3{1}		4091	2423		4.47	(16) OCC	15.51	141.48
Sus. + E4{1}		4091	2423		4.47	(16) OCC	15.51	141.48
Sus. + W1{1}		4091	8904		4.47	(16) OCC	23.75	141.48

Sus. + W2{1}	4091	8904	4.47	(16)	OCC	23.75	141.48
Sus. + W3{1}	4091	4267	4.47	(16)	OCC	17.85	141.48
Sus. + W4{1}	4091	4267	4.47	(16)	OCC	17.85	141.48

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		ASME B31.1 (2014) CODE COMPLIANCE					
		(Moments in N.m )		(Stress in N/mm2 )			
Point name	Load combination	Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no. type	Code Stress Allow.
A09 N+	Max P{1}					( 3) HOOP	21.30 117.90
	GR + Max P{1}	10907			4.47	(15) SUST	21.09 117.90
	TR:Amb to Tl{1}			8368	4.47	(17) DISP	14.18 176.85
	Amb to Tl{1}			8368	4.47	(17) DISP	14.18 176.85
	Sus. + E1{1}	10907	1449		4.47	(16) OCC	22.93 141.48
	Sus. + E2{1}	10907	1449		4.47	(16) OCC	22.93 141.48
	Sus. + E3{1}	10907	918		4.47	(16) OCC	22.26 141.48
	Sus. + E4{1}	10907	918		4.47	(16) OCC	22.26 141.48
	Sus. + W1{1}	10907	949		4.47	(16) OCC	22.30 141.48
	Sus. + W2{1}	10907	949		4.47	(16) OCC	22.30 141.48
	Sus. + W3{1}	10907	1198		4.47	(16) OCC	22.62 141.48
	Sus. + W4{1}	10907	1198		4.47	(16) OCC	22.62 141.48
A08 +	Max P{1}					( 3) HOOP	21.30 117.90
	GR + Max P{1}	9218			1.00	(15) SUST	10.73 117.90
	TR:Amb to Tl{1}			25445	1.00	(17) DISP	9.64 176.85
	Amb to Tl{1}			25445	1.00	(17) DISP	9.64 176.85
	Sus. + E1{1}	9218	17455		1.00	(16) OCC	17.34 141.48
	Sus. + E2{1}	9218	17455		1.00	(16) OCC	17.34 141.48
	Sus. + E3{1}	9218	11513		1.00	(16) OCC	15.09 141.48
	Sus. + E4{1}	9218	11513		1.00	(16) OCC	15.09 141.48
	Sus. + W1{1}	9218	29114		1.00	(16) OCC	21.76 141.48
	Sus. + W2{1}	9218	29114		1.00	(16) OCC	21.76 141.48
	Sus. + W3{1}	9218	14536		1.00	(16) OCC	16.23 141.48
	Sus. + W4{1}	9218	14536		1.00	(16) OCC	16.23 141.48
A08 -	Max P{1}					( 3) HOOP	21.30 117.90
	GR + Max P{1}	9218			1.00	(15) SUST	10.73 117.90
	TR:Amb to Tl{1}			25445	1.00	(17) DISP	9.64 176.85
	Amb to Tl{1}			25445	1.00	(17) DISP	9.64 176.85
	Sus. + E1{1}	9218	17455		1.00	(16) OCC	17.34 141.48
	Sus. + E2{1}	9218	17455		1.00	(16) OCC	17.34 141.48
	Sus. + E3{1}	9218	11513		1.00	(16) OCC	15.09 141.48
	Sus. + E4{1}	9218	11513		1.00	(16) OCC	15.09 141.48
	Sus. + W1{1}	9218	29114		1.00	(16) OCC	21.76 141.48
	Sus. + W2{1}	9218	29114		1.00	(16) OCC	21.76 141.48
	Sus. + W3{1}	9218	14536		1.00	(16) OCC	16.23 141.48
	Sus. + W4{1}	9218	14536		1.00	(16) OCC	16.23 141.48
A15	Max P{1}					( 3) HOOP	21.30 117.90
	GR + Max P{1}	2676			1.00	(15) SUST	8.25 117.90
	TR:Amb to Tl{1}			2776	1.00	(17) DISP	1.05 176.85
	Amb to Tl{1}			2776	1.00	(17) DISP	1.05 176.85
	Sus. + E1{1}	2676	10426		1.00	(16) OCC	12.20 141.48
	Sus. + E2{1}	2676	10426		1.00	(16) OCC	12.20 141.48
	Sus. + E3{1}	2676	10402		1.00	(16) OCC	12.19 141.48
	Sus. + E4{1}	2676	10402		1.00	(16) OCC	12.19 141.48
	Sus. + W1{1}	2676	21878		1.00	(16) OCC	16.54 141.48
	Sus. + W2{1}	2676	21878		1.00	(16) OCC	16.54 141.48
	Sus. + W3{1}	2676	17316		1.00	(16) OCC	14.81 141.48
	Sus. + W4{1}	2676	17316		1.00	(16) OCC	14.81 141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A14 F+	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	4091			1.00		(15) SUST	8.78	117.90
	TR:Amb to T1{1}			2366	1.00		(17) DISP	0.90	176.85
	Amb to T1{1}			2366	1.00		(17) DISP	0.90	176.85
	Sus. + E1{1}	4091	4818		1.00		(16) OCC	10.61	141.48
	Sus. + E2{1}	4091	4818		1.00		(16) OCC	10.61	141.48
	Sus. + E3{1}	4091	2423		1.00		(16) OCC	9.70	141.48
	Sus. + E4{1}	4091	2423		1.00		(16) OCC	9.70	141.48
	Sus. + W1{1}	4091	8904		1.00		(16) OCC	12.16	141.48
	Sus. + W2{1}	4091	8904		1.00		(16) OCC	12.16	141.48
	Sus. + W3{1}	4091	4267		1.00		(16) OCC	10.40	141.48
	Sus. + W4{1}	4091	4267		1.00		(16) OCC	10.40	141.48
A14 N+	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	1664			4.47		(15) SUST	9.35	117.90
	TR:Amb to T1{1}			1691	4.47		(17) DISP	2.87	176.85
	Amb to T1{1}			1691	4.47		(17) DISP	2.87	176.85
	Sus. + E1{1}	1664	3652		4.47		(16) OCC	13.99	141.48
	Sus. + E2{1}	1664	3652		4.47		(16) OCC	13.99	141.48
	Sus. + E3{1}	1664	1922		4.47		(16) OCC	11.79	141.48
	Sus. + E4{1}	1664	1922		4.47		(16) OCC	11.79	141.48
	Sus. + W1{1}	1664	6217		4.47		(16) OCC	17.25	141.48
	Sus. + W2{1}	1664	6217		4.47		(16) OCC	17.25	141.48
	Sus. + W3{1}	1664	3564		4.47		(16) OCC	13.88	141.48
	Sus. + W4{1}	1664	3564		4.47		(16) OCC	13.88	141.48
A14 N-	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	1664			1.00		(15) SUST	7.86	117.90
	TR:Amb to T1{1}			1691	1.00		(17) DISP	0.64	176.85
	Amb to T1{1}			1691	1.00		(17) DISP	0.64	176.85
	Sus. + E1{1}	1664	3652		1.00		(16) OCC	9.25	141.48
	Sus. + E2{1}	1664	3652		1.00		(16) OCC	9.25	141.48
	Sus. + E3{1}	1664	1922		1.00		(16) OCC	8.59	141.48
	Sus. + E4{1}	1664	1922		1.00		(16) OCC	8.59	141.48
	Sus. + W1{1}	1664	6217		1.00		(16) OCC	10.22	141.48
	Sus. + W2{1}	1664	6217		1.00		(16) OCC	10.22	141.48
	Sus. + W3{1}	1664	3564		1.00		(16) OCC	9.21	141.48
	Sus. + W4{1}	1664	3564		1.00		(16) OCC	9.21	141.48
A13 F+	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	4507			1.00		(15) SUST	8.94	117.90
	TR:Amb to T1{1}			2880	1.00		(17) DISP	1.09	176.85
	Amb to T1{1}			2880	1.00		(17) DISP	1.09	176.85
	Sus. + E1{1}	4507	2649		1.00		(16) OCC	9.95	141.48
	Sus. + E2{1}	4507	2649		1.00		(16) OCC	9.95	141.48
	Sus. + E3{1}	4507	1220		1.00		(16) OCC	9.40	141.48
	Sus. + E4{1}	4507	1220		1.00		(16) OCC	9.40	141.48
	Sus. + W1{1}	4507	5576		1.00		(16) OCC	11.05	141.48
	Sus. + W2{1}	4507	5576		1.00		(16) OCC	11.05	141.48
	Sus. + W3{1}	4507	2072		1.00		(16) OCC	9.73	141.48
	Sus. + W4{1}	4507	2072		1.00		(16) OCC	9.73	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A13 F-	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	4507			4.47		(15) SUST	12.96	117.90

TR:Amb to T1{1}			2880	4.47	(17)	DISP	4.88	176.85
Amb to T1{1}			2880	4.47	(17)	DISP	4.88	176.85
Sus. + E1{1}	4507	2649		4.47	(16)	OCC	16.33	141.48
Sus. + E2{1}	4507	2649		4.47	(16)	OCC	16.33	141.48
Sus. + E3{1}	4507	1220		4.47	(16)	OCC	14.51	141.48
Sus. + E4{1}	4507	1220		4.47	(16)	OCC	14.51	141.48
Sus. + W1{1}	4507	5576		4.47	(16)	OCC	20.05	141.48
Sus. + W2{1}	4507	5576		4.47	(16)	OCC	20.05	141.48
Sus. + W3{1}	4507	2072		4.47	(16)	OCC	15.59	141.48
Sus. + W4{1}	4507	2072		4.47	(16)	OCC	15.59	141.48
A13 N+ Max P{1}					( 3)	HOOP	21.30	117.90
GR + Max P{1}	2095			4.47	(15)	SUST	9.90	117.90
TR:Amb to T1{1}			3635	4.47	(17)	DISP	6.16	176.85
Amb to T1{1}			3635	4.47	(17)	DISP	6.16	176.85
Sus. + E1{1}	2095	3436		4.47	(16)	OCC	14.26	141.48
Sus. + E2{1}	2095	3436		4.47	(16)	OCC	14.26	141.48
Sus. + E3{1}	2095	1523		4.47	(16)	OCC	11.83	141.48
Sus. + E4{1}	2095	1523		4.47	(16)	OCC	11.83	141.48
Sus. + W1{1}	2095	7453		4.47	(16)	OCC	19.37	141.48
Sus. + W2{1}	2095	7453		4.47	(16)	OCC	19.37	141.48
Sus. + W3{1}	2095	2859		4.47	(16)	OCC	13.53	141.48
Sus. + W4{1}	2095	2859		4.47	(16)	OCC	13.53	141.48
A13 N- Max P{1}					( 3)	HOOP	21.30	117.90
GR + Max P{1}	2095			1.00	(15)	SUST	8.03	117.90
TR:Amb to T1{1}			3635	1.00	(17)	DISP	1.38	176.85
Amb to T1{1}			3635	1.00	(17)	DISP	1.38	176.85
Sus. + E1{1}	2095	3436		1.00	(16)	OCC	9.33	141.48
Sus. + E2{1}	2095	3436		1.00	(16)	OCC	9.33	141.48
Sus. + E3{1}	2095	1523		1.00	(16)	OCC	8.60	141.48
Sus. + E4{1}	2095	1523		1.00	(16)	OCC	8.60	141.48
Sus. + W1{1}	2095	7453		1.00	(16)	OCC	10.85	141.48
Sus. + W2{1}	2095	7453		1.00	(16)	OCC	10.85	141.48
Sus. + W3{1}	2095	2859		1.00	(16)	OCC	9.11	141.48
Sus. + W4{1}	2095	2859		1.00	(16)	OCC	9.11	141.48
A12 + Max P{1}					( 3)	HOOP	21.30	117.90
GR + Max P{1}	9691			1.00	(15)	SUST	10.91	117.90
TR:Amb to T1{1}			4965	1.00	(17)	DISP	1.88	176.85
Amb to T1{1}			4965	1.00	(17)	DISP	1.88	176.85
Sus. + E1{1}	9691	2098		1.00	(16)	OCC	11.70	141.48
Sus. + E2{1}	9691	2098		1.00	(16)	OCC	11.70	141.48
Sus. + E3{1}	9691	2542		1.00	(16)	OCC	11.87	141.48
Sus. + E4{1}	9691	2542		1.00	(16)	OCC	11.87	141.48
Sus. + W1{1}	9691	5545		1.00	(16)	OCC	13.01	141.48
Sus. + W2{1}	9691	5545		1.00	(16)	OCC	13.01	141.48
Sus. + W3{1}	9691	3173		1.00	(16)	OCC	12.11	141.48
Sus. + W4{1}	9691	3173		1.00	(16)	OCC	12.11	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A12 - Max P{1}						( 3)	HOOP	21.30	117.90
GR + Max P{1}		9691			1.00	(15)	SUST	10.91	117.90
TR:Amb to T1{1}				4965	1.00	(17)	DISP	1.88	176.85
Amb to T1{1}				4965	1.00	(17)	DISP	1.88	176.85
Sus. + E1{1}		9691	2098		1.00	(16)	OCC	11.70	141.48
Sus. + E2{1}		9691	2098		1.00	(16)	OCC	11.70	141.48
Sus. + E3{1}		9691	2542		1.00	(16)	OCC	11.87	141.48
Sus. + E4{1}		9691	2542		1.00	(16)	OCC	11.87	141.48
Sus. + W1{1}		9691	5545		1.00	(16)	OCC	13.01	141.48
Sus. + W2{1}		9691	5545		1.00	(16)	OCC	13.01	141.48
Sus. + W3{1}		9691	3173		1.00	(16)	OCC	12.11	141.48
Sus. + W4{1}		9691	3173		1.00	(16)	OCC	12.11	141.48
A11 F+ Max P{1}						( 3)	HOOP	21.30	117.90
GR + Max P{1}		9384			1.00	(15)	SUST	10.79	117.90
TR:Amb to T1{1}				4889	1.00	(17)	DISP	1.85	176.85
Amb to T1{1}				4889	1.00	(17)	DISP	1.85	176.85
Sus. + E1{1}		9384	2021		1.00	(16)	OCC	11.55	141.48
Sus. + E2{1}		9384	2021		1.00	(16)	OCC	11.55	141.48

Sus. + E3{1}	9384	2318	1.00	(16)	OCC	11.67	141.48	
Sus. + E4{1}	9384	2318	1.00	(16)	OCC	11.67	141.48	
Sus. + W1{1}	9384	5421	1.00	(16)	OCC	12.84	141.48	
Sus. + W2{1}	9384	5421	1.00	(16)	OCC	12.84	141.48	
Sus. + W3{1}	9384	2988	1.00	(16)	OCC	11.92	141.48	
Sus. + W4{1}	9384	2988	1.00	(16)	OCC	11.92	141.48	
All N+ Max P{1}				( 3)	HOOP	21.30	117.90	
GR + Max P{1}	7126		4.47	(15)	SUST	16.29	117.90	
TR:Amb to T1{1}			7168	4.47	(17)	DISP	12.15	176.85
Amb to T1{1}			7168	4.47	(17)	DISP	12.15	176.85
Sus. + E1{1}	7126	818	4.47	(16)	OCC	17.33	141.48	
Sus. + E2{1}	7126	818	4.47	(16)	OCC	17.33	141.48	
Sus. + E3{1}	7126	520	4.47	(16)	OCC	16.95	141.48	
Sus. + E4{1}	7126	520	4.47	(16)	OCC	16.95	141.48	
Sus. + W1{1}	7126	2880	4.47	(16)	OCC	19.95	141.48	
Sus. + W2{1}	7126	2880	4.47	(16)	OCC	19.95	141.48	
Sus. + W3{1}	7126	1208	4.47	(16)	OCC	17.82	141.48	
Sus. + W4{1}	7126	1208	4.47	(16)	OCC	17.82	141.48	
All N- Max P{1}				( 3)	HOOP	21.30	117.90	
GR + Max P{1}	7126		1.00	(15)	SUST	9.93	117.90	
TR:Amb to T1{1}			7168	1.00	(17)	DISP	2.72	176.85
Amb to T1{1}			7168	1.00	(17)	DISP	2.72	176.85
Sus. + E1{1}	7126	818	1.00	(16)	OCC	10.24	141.48	
Sus. + E2{1}	7126	818	1.00	(16)	OCC	10.24	141.48	
Sus. + E3{1}	7126	520	1.00	(16)	OCC	10.13	141.48	
Sus. + E4{1}	7126	520	1.00	(16)	OCC	10.13	141.48	
Sus. + W1{1}	7126	2880	1.00	(16)	OCC	11.02	141.48	
Sus. + W2{1}	7126	2880	1.00	(16)	OCC	11.02	141.48	
Sus. + W3{1}	7126	1208	1.00	(16)	OCC	10.39	141.48	
Sus. + W4{1}	7126	1208	1.00	(16)	OCC	10.39	141.48	

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE		(Moments in N.m )		(Stress in N/mm2 )		Code Stress	Code Allow.	
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type			
A09 F+ Max P{1}						( 3)	HOOP	21.30	117.90	
GR + Max P{1}		20783				1.00	(15)	SUST	15.11	117.90
TR:Amb to T1{1}				6710		1.00	(17)	DISP	2.54	176.85
Amb to T1{1}				6710		1.00	(17)	DISP	2.54	176.85
Sus. + E1{1}		20783	604			1.00	(16)	OCC	15.34	141.48
Sus. + E2{1}		20783	604			1.00	(16)	OCC	15.34	141.48
Sus. + E3{1}		20783	951			1.00	(16)	OCC	15.47	141.48
Sus. + E4{1}		20783	951			1.00	(16)	OCC	15.47	141.48
Sus. + W1{1}		20783	1966			1.00	(16)	OCC	15.85	141.48
Sus. + W2{1}		20783	1966			1.00	(16)	OCC	15.85	141.48
Sus. + W3{1}		20783	1053			1.00	(16)	OCC	15.51	141.48
Sus. + W4{1}		20783	1053			1.00	(16)	OCC	15.51	141.48
A09 N- Max P{1}						( 3)	HOOP	21.30	117.90	
GR + Max P{1}		10907				1.00	(15)	SUST	11.37	117.90
TR:Amb to T1{1}				8368		1.00	(17)	DISP	3.17	176.85
Amb to T1{1}				8368		1.00	(17)	DISP	3.17	176.85
Sus. + E1{1}		10907	1449			1.00	(16)	OCC	11.92	141.48
Sus. + E2{1}		10907	1449			1.00	(16)	OCC	11.92	141.48
Sus. + E3{1}		10907	918			1.00	(16)	OCC	11.71	141.48
Sus. + E4{1}		10907	918			1.00	(16)	OCC	11.71	141.48
Sus. + W1{1}		10907	949			1.00	(16)	OCC	11.73	141.48
Sus. + W2{1}		10907	949			1.00	(16)	OCC	11.73	141.48
Sus. + W3{1}		10907	1198			1.00	(16)	OCC	11.82	141.48
Sus. + W4{1}		10907	1198			1.00	(16)	OCC	11.82	141.48
A07 F+ Max P{1}						( 3)	HOOP	21.30	117.90	
GR + Max P{1}		11121				1.00	(15)	SUST	11.45	117.90
TR:Amb to T1{1}				14990		1.00	(17)	DISP	5.68	176.85
Amb to T1{1}				14990		1.00	(17)	DISP	5.68	176.85
Sus. + E1{1}		11121	1597			1.00	(16)	OCC	12.05	141.48
Sus. + E2{1}		11121	1597			1.00	(16)	OCC	12.05	141.48
Sus. + E3{1}		11121	1925			1.00	(16)	OCC	12.18	141.48
Sus. + E4{1}		11121	1925			1.00	(16)	OCC	12.18	141.48
Sus. + W1{1}		11121	3326			1.00	(16)	OCC	12.71	141.48
Sus. + W2{1}		11121	3326			1.00	(16)	OCC	12.71	141.48

Sus. + W3{1}	11121	2181		1.00	(16)	OCC	12.27	141.48
Sus. + W4{1}	11121	2181		1.00	(16)	OCC	12.27	141.48
A07 N- Max P{1}					( 3)	HOOP	21.30	117.90
GR + Max P{1}	10444			1.00	(15)	SUST	11.19	117.90
TR:Amb to T1{1}			15455	1.00	(17)	DISP	5.86	176.85
Amb to T1{1}			15455	1.00	(17)	DISP	5.86	176.85
Sus. + E1{1}	10444	1479		1.00	(16)	OCC	11.75	141.48
Sus. + E2{1}	10444	1479		1.00	(16)	OCC	11.75	141.48
Sus. + E3{1}	10444	2182		1.00	(16)	OCC	12.02	141.48
Sus. + E4{1}	10444	2182		1.00	(16)	OCC	12.02	141.48
Sus. + W1{1}	10444	2540		1.00	(16)	OCC	12.15	141.48
Sus. + W2{1}	10444	2540		1.00	(16)	OCC	12.15	141.48
Sus. + W3{1}	10444	2484		1.00	(16)	OCC	12.13	141.48
Sus. + W4{1}	10444	2484		1.00	(16)	OCC	12.13	141.48

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ASME B31.1 (2014) CODE COMPLIANCE									
Point name	Load combination	(Moments in N.m )			(Stress in N/mm2 )			Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. Load no.	type		
A06 F+	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	12072			1.00	(15)	SUST	11.81	117.90
	TR:Amb to T1{1}			10967	1.00	(17)	DISP	4.16	176.85
	Amb to T1{1}			10967	1.00	(17)	DISP	4.16	176.85
	Sus. + E1{1}	12072	4073		1.00	(16)	OCC	13.35	141.48
	Sus. + E2{1}	12072	4073		1.00	(16)	OCC	13.35	141.48
	Sus. + E3{1}	12072	3229		1.00	(16)	OCC	13.03	141.48
	Sus. + E4{1}	12072	3229		1.00	(16)	OCC	13.03	141.48
	Sus. + W1{1}	12072	5092		1.00	(16)	OCC	13.74	141.48
	Sus. + W2{1}	12072	5092		1.00	(16)	OCC	13.74	141.48
	Sus. + W3{1}	12072	4074		1.00	(16)	OCC	13.35	141.48
	Sus. + W4{1}	12072	4074		1.00	(16)	OCC	13.35	141.48
A06 N-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	11997			1.00	(15)	SUST	11.78	117.90
	TR:Amb to T1{1}			11142	1.00	(17)	DISP	4.22	176.85
	Amb to T1{1}			11142	1.00	(17)	DISP	4.22	176.85
	Sus. + E1{1}	11997	4084		1.00	(16)	OCC	13.33	141.48
	Sus. + E2{1}	11997	4084		1.00	(16)	OCC	13.33	141.48
	Sus. + E3{1}	11997	3112		1.00	(16)	OCC	12.96	141.48
	Sus. + E4{1}	11997	3112		1.00	(16)	OCC	12.96	141.48
	Sus. + W1{1}	11997	5184		1.00	(16)	OCC	13.74	141.48
	Sus. + W2{1}	11997	5184		1.00	(16)	OCC	13.74	141.48
	Sus. + W3{1}	11997	3948		1.00	(16)	OCC	13.28	141.48
	Sus. + W4{1}	11997	3948		1.00	(16)	OCC	13.28	141.48
A05 F+	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	4052			1.00	(15)	SUST	8.77	117.90
	TR:Amb to T1{1}			22644	1.00	(17)	DISP	8.58	176.85
	Amb to T1{1}			22644	1.00	(17)	DISP	8.58	176.85
	Sus. + E1{1}	4052	3766		1.00	(16)	OCC	10.20	141.48
	Sus. + E2{1}	4052	3766		1.00	(16)	OCC	10.20	141.48
	Sus. + E3{1}	4052	885		1.00	(16)	OCC	9.10	141.48
	Sus. + E4{1}	4052	885		1.00	(16)	OCC	9.10	141.48
	Sus. + W1{1}	4052	4949		1.00	(16)	OCC	10.64	141.48
	Sus. + W2{1}	4052	4949		1.00	(16)	OCC	10.64	141.48
	Sus. + W3{1}	4052	880		1.00	(16)	OCC	9.10	141.48
	Sus. + W4{1}	4052	880		1.00	(16)	OCC	9.10	141.48
A05 N-	Max P{1}					( 3)	HOOP	21.30	117.90
	GR + Max P{1}	3087			1.00	(15)	SUST	8.40	117.90
	TR:Amb to T1{1}			21215	1.00	(17)	DISP	8.04	176.85
	Amb to T1{1}			21215	1.00	(17)	DISP	8.04	176.85
	Sus. + E1{1}	3087	2526		1.00	(16)	OCC	9.36	141.48
	Sus. + E2{1}	3087	2526		1.00	(16)	OCC	9.36	141.48
	Sus. + E3{1}	3087	1914		1.00	(16)	OCC	9.13	141.48
	Sus. + E4{1}	3087	1914		1.00	(16)	OCC	9.13	141.48
	Sus. + W1{1}	3087	3227		1.00	(16)	OCC	9.63	141.48
	Sus. + W2{1}	3087	3227		1.00	(16)	OCC	9.63	141.48
	Sus. + W3{1}	3087	2413		1.00	(16)	OCC	9.32	141.48
	Sus. + W4{1}	3087	2413		1.00	(16)	OCC	9.32	141.48



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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A04 F+	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	3979			1.00		(15) SUST	8.74	117.90
	TR:Amb to T1{1}			17849	1.00		(17) DISP	6.76	176.85
	Amb to T1{1}			17849	1.00		(17) DISP	6.76	176.85
	Sus. + E1{1}	3979	2681		1.00		(16) OCC	9.76	141.48
	Sus. + E2{1}	3979	2681		1.00		(16) OCC	9.76	141.48
	Sus. + E3{1}	3979	1908		1.00		(16) OCC	9.46	141.48
	Sus. + E4{1}	3979	1908		1.00		(16) OCC	9.46	141.48
	Sus. + W1{1}	3979	3326		1.00		(16) OCC	10.00	141.48
	Sus. + W2{1}	3979	3326		1.00		(16) OCC	10.00	141.48
	Sus. + W3{1}	3979	1889		1.00		(16) OCC	9.46	141.48
	Sus. + W4{1}	3979	1889		1.00		(16) OCC	9.46	141.48
A04 N-	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	8792			1.00		(15) SUST	10.56	117.90
	TR:Amb to T1{1}			30643	1.00		(17) DISP	11.61	176.85
	Amb to T1{1}			30643	1.00		(17) DISP	11.61	176.85
	Sus. + E1{1}	8792	4945		1.00		(16) OCC	12.44	141.48
	Sus. + E2{1}	8792	4945		1.00		(16) OCC	12.44	141.48
	Sus. + E3{1}	8792	2376		1.00		(16) OCC	11.47	141.48
	Sus. + E4{1}	8792	2376		1.00		(16) OCC	11.47	141.48
	Sus. + W1{1}	8792	6384		1.00		(16) OCC	12.98	141.48
	Sus. + W2{1}	8792	6384		1.00		(16) OCC	12.98	141.48
	Sus. + W3{1}	8792	2032		1.00		(16) OCC	11.33	141.48
	Sus. + W4{1}	8792	2032		1.00		(16) OCC	11.33	141.48
A03 +	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	23324			1.00		(15) SUST	16.07	117.90
	TR:Amb to T1{1}			51288	1.00		(17) DISP	19.44	176.85
	Amb to T1{1}			51288	1.00		(17) DISP	19.44	176.85
	Sus. + E1{1}	23324	4387		1.00		(16) OCC	17.73	141.48
	Sus. + E2{1}	23324	4387		1.00		(16) OCC	17.73	141.48
	Sus. + E3{1}	23324	10929		1.00		(16) OCC	20.21	141.48
	Sus. + E4{1}	23324	10929		1.00		(16) OCC	20.21	141.48
	Sus. + W1{1}	23324	5746		1.00		(16) OCC	18.25	141.48
	Sus. + W2{1}	23324	5746		1.00		(16) OCC	18.25	141.48
	Sus. + W3{1}	23324	10357		1.00		(16) OCC	20.00	141.48
	Sus. + W4{1}	23324	10357		1.00		(16) OCC	20.00	141.48
A03 -	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	23324			1.00		(15) SUST	16.07	117.90
	TR:Amb to T1{1}			51288	1.00		(17) DISP	19.44	176.85
	Amb to T1{1}			51288	1.00		(17) DISP	19.44	176.85
	Sus. + E1{1}	23324	4387		1.00		(16) OCC	17.73	141.48
	Sus. + E2{1}	23324	4387		1.00		(16) OCC	17.73	141.48
	Sus. + E3{1}	23324	10929		1.00		(16) OCC	20.21	141.48
	Sus. + E4{1}	23324	10929		1.00		(16) OCC	20.21	141.48
	Sus. + W1{1}	23324	5746		1.00		(16) OCC	18.25	141.48
	Sus. + W2{1}	23324	5746		1.00		(16) OCC	18.25	141.48
	Sus. + W3{1}	23324	10357		1.00		(16) OCC	20.00	141.48
	Sus. + W4{1}	23324	10357		1.00		(16) OCC	20.00	141.48

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Point name	Load combination	ASME B31.1 (2014) CODE COMPLIANCE (Moments in N.m )			(Stress in N/mm2 )		Eq. Load no. type	Code Stress	Code Allow.
		Ma (Sus.)	Mb (Occ.)	Mc (Exp.)	S.I.F				
A02 F+	Max P{1}						( 3) HOOP	21.30	117.90
	GR + Max P{1}	9240			1.00		(15) SUST	10.73	117.90

TR:Amb to T1{1}			25452	1.00	(17)	DISP	9.65	176.85
Amb to T1{1}			25452	1.00	(17)	DISP	9.65	176.85
Sus. + E1{1}	9240	2206		1.00	(16)	OCC	11.57	141.48
Sus. + E2{1}	9240	2206		1.00	(16)	OCC	11.57	141.48
Sus. + E3{1}	9240	3685		1.00	(16)	OCC	12.13	141.48
Sus. + E4{1}	9240	3685		1.00	(16)	OCC	12.13	141.48
Sus. + W1{1}	9240	2591		1.00	(16)	OCC	11.72	141.48
Sus. + W2{1}	9240	2591		1.00	(16)	OCC	11.72	141.48
Sus. + W3{1}	9240	3388		1.00	(16)	OCC	12.02	141.48
Sus. + W4{1}	9240	3388		1.00	(16)	OCC	12.02	141.48
A02 N-								
Max P{1}					( 3)	HOOP	21.30	117.90
GR + Max P{1}	6776			1.00	(15)	SUST	9.80	117.90
TR:Amb to T1{1}			52690	1.00	(17)	DISP	19.97	176.85
Amb to T1{1}			52690	1.00	(17)	DISP	19.97	176.85
Sus. + E1{1}	6776	2900		1.00	(16)	OCC	10.90	141.48
Sus. + E2{1}	6776	2900		1.00	(16)	OCC	10.90	141.48
Sus. + E3{1}	6776	3575		1.00	(16)	OCC	11.16	141.48
Sus. + E4{1}	6776	3575		1.00	(16)	OCC	11.16	141.48
Sus. + W1{1}	6776	3004		1.00	(16)	OCC	10.94	141.48
Sus. + W2{1}	6776	3004		1.00	(16)	OCC	10.94	141.48
Sus. + W3{1}	6776	3220		1.00	(16)	OCC	11.02	141.48
Sus. + W4{1}	6776	3220		1.00	(16)	OCC	11.02	141.48
A00								
Max P{1}					( 3)	HOOP	21.30	117.90
GR + Max P{1}	8486			1.00	(15)	SUST	10.45	117.90
TR:Amb to T1{1}			52370	1.00	(17)	DISP	19.85	176.85
Amb to T1{1}			52370	1.00	(17)	DISP	19.85	176.85
Sus. + E1{1}	8486	6232		1.00	(16)	OCC	12.81	141.48
Sus. + E2{1}	8486	6232		1.00	(16)	OCC	12.81	141.48
Sus. + E3{1}	8486	6231		1.00	(16)	OCC	12.81	141.48
Sus. + E4{1}	8486	6231		1.00	(16)	OCC	12.81	141.48
Sus. + W1{1}	8486	6195		1.00	(16)	OCC	12.80	141.48
Sus. + W2{1}	8486	6195		1.00	(16)	OCC	12.80	141.48
Sus. + W3{1}	8486	5469		1.00	(16)	OCC	12.52	141.48
Sus. + W4{1}	8486	5469		1.00	(16)	OCC	12.52	141.48

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R E S U L T   S U M M A R Y  
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Maximum sustained stress ratio

Point : A06 F  
Stress N/mm2 : 36.42  
Allowable N/mm2 : 117.90  
Ratio : 0.31  
Load combination : GR + Max P{1}

Maximum displacement stress ratio

Point : A02 N  
Stress N/mm2 : 89.28  
Allowable N/mm2 : 176.85  
Ratio : 0.50  
Load combination : Max Range

Maximum occasional stress ratio

Point : A06 N  
Stress N/mm2 : 48.77  
Allowable N/mm2 : 141.48  
Ratio : 0.34  
Load combination : Sus. + W1{1}

Maximum hoop stress ratio

Point : A02 N  
Stress N/mm2 : 21.30  
Allowable N/mm2 : 117.90  
Ratio : 0.18  
Load combination : Max P{1}

## BIODATA PENULIS



Nur Kholifah lahir pada 04 Juli 1996 di Kota Surabaya merupakan anak terakhir dari empat bersaudara. Penulis menempuh pendidikan tingkat dasar di SDN Siwalankerto I/418, kemudian menempuh pendidikan tingkat menengah pertama di SMP Negeri 3 Surabaya, dilanjutkan tingkat menengah atas di SMA Negeri 16 Surabaya, dan kemudian Penulis mulai menempuh pendidikan di S-1 di Departemen Teknik Kelautan, Fakultas Teknologi Kelautan, Institut Teknologi Sepuluh Nopember (ITS) Surabaya pada tahun 2014. Selama menempuh masa perkuliahan, Penulis aktif di berbagai kegiatan organisasi dan kepanitiaan. Penulis pernah menjadi Pemandu Samudera 8 FTK ITS, Kepala Divisi *Entrepreneur Development* HIMATEKLA FTK ITS 2016/2017, Ketua Acara Seminar Nasional OCEANO 6, Staff Ahli *Sponsorship* ITS EXPO 2016, dan Ketua Divisi Acara OCEANO 2017. Selain itu Penulis juga aktif di berbagai kegiatan sosial, Penulis pernah menjadi Pengajar Tangguh ITS Mengajar *for* Indonesia *Batch* 3 selama satu bulan mengajar di Tuban, Jawa Timur. Penulis memiliki pengalaman kerja menjadi pengajar privat di salah satu Lembaga Bimbingan Belajar dan pengalaman kerja praktek di Departemen *Piping* PT General Electric Power Indonesia selama dua bulan. Penulis mengakhiri masa perkuliahan dengan membuat Tugas Akhir yang berjudul “Pengaruh Penggunaan *Expansion Joint* Terhadap Tegangan Sistem Perpipaan *Heat Recovery Steam Generator* (HRSG)”.