TUGAS AKHIR – MO141326

ANALISIS *LOCAL BUCKLING* PIPA BAWAH LAUT 20 INCH PADA SAAT INSTALASI DENGAN METODE S-LAY DI BLOK DA DAN BH, SELAT MADURA

FEBRIANTI
NRP. 4313100083

Dosen pembimbing :
Ir. Imam Rochani, M.Sc.
Ir. J. J. Soedjono, M.Sc.

DEPARTEMEN TEKNIK KELAUTAN
Fakultas Teknologi Kelautan
Institut Teknologi Sepuluh Nopember
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LOCAL BUCKLING ANALYSIS DURING INSTALLATION OF 20 INCH PIPELINE USING S-LAY METHOD IN MDA/MBH, MADURA STRAIT

FEBRIANTI
NRP. 4313100083

Supervisors :
Ir. Imam Rochani, M.Sc.
Ir. J. J. Soedjono, M.Sc.

OCEAN ENGINEERING DEPARTMENT
Faculty of Marine Technolofy
Sepuluh Nopember Institute of Technology
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TUGAS AKHIR

Diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Teknik (ST) pada Program Studi S-1 Jurusan Teknik Kelautan Fakultas Teknologi Kelautan Institut Teknologi Sepuluh Nopember Surabaya

Oleh :

FEBRIANTI 4313100083

Disetujui oleh :

1. Ir. Imam Rochani, M.Sc. (Pembimbing 1)

.....

2. Ir. J. J. Soedjono, M.Sc. (Pembimbing 2)

.....

3. Ir. Handayanu, M.Sc. Ph.D. (Penguji 1)

.....

4. Nur Syahroni, S.T. M.T. Ph.D. (Penguji 2)

.....

5. Dr. Yeyes Mulyadi, S.T. M.Sc. (Penguji 3)

.....

SURABAYA, JULI 2017

ANALISIS *LOCAL BUCKLING* PIPA BAWAH LAUT 20 INCH PADA SAAT INSTALASI DENGAN METODE S-LAY DI BLOK DA DAN BH, SELAT MADURA

Nama : Febrianti

NRP : 4313100083

Departemen : Teknik Kelautan FTK−ITS

Dosen Pembimbing : Ir. Imam Rochani, M.Sc.

Ir. J. J. Soedjono, M.Sc.

Abstrak

Pipa bawah laut telah terbukti efisien dan efektif karena pelaksaan tranportasinya tidak tergantung oleh cuaca, namun proses instalasi pipa bawah laut sangat bergantung pada kondisi lingkungan seperti gelombang dan arus yang mengenai pipa secara langsung yang berpengaruh dengan gerakan *barge*. Sebelum dilakukan proses instalasi, dilakukan analisis besar tegangan terlebih dahulu agar diketahui pipa berada dalam kondisi yang diijinkan. Pada penelitian ini, metode instalasi yang sesuai adalah metode S-Lay, dimana pipa akan dianalisis ketika proses instalasi akibat beban dinamis. Beban dinamis berpengaruh pada kejadian *buckling* yang mengakibatkan kegagalan ketika proses instalasi. Permodelan *barge* dilakukan dengan bantuan *software* MOSES dan analisis dinamis instalasi pipa dilakukan dengan bantuan *software* OFFPIPE. Jika telah didapatkan tegangan yang terjadi pada pipa, analisis dilanjutkan dengan perhitungan *local buckling* berdasarkan DNV OS F-101 (2013) untuk mengetahui apakah terjadi *local buckling*. Dari hasil analisis yang dilakukan, pipa mengalami tegangan maksimum sebesar 81.66% SMYS pada kedalaman 109 m dengan gelombang datang arah 0^{o}, sehingga keseluruhan tegangan yang terjadi pada pipa tidak melebihi tegangan izin dan dapat disimpulkan bahwa semakin besar kedalaman air laut maka semakin besar tegangan yang diterima oleh pipa. Nilai *unity check* terbesar untuk *local buckling* bernilai 0.738 pada kedalaman 109 m, maka tidak terjadi *local buckling* di sepanjang 27 km *pipeline*.

Kata Kunci: *Instalasi*, *Pipeline*, *Overbend*, *Sagbend*, dan *Local Buckling*.

LOCAL BUCKLING ANALYSIS DURING INSTALLATION OF 20 INCH PIPELINE USING S-LAY METHOD IN MDA/MBH, MADURA STRAIT

Name : Febrianti
NRP : 4313100083
Department : Ocean Engineering, FTK−ITS
Supervisors : Ir. Imam Rochani, M.Sc.
Ir. J. J. Soedjono, M.Sc

Abstract

Subsea pipelines have proven to be efficient and effective since their transport operations are not depend on weather, however the installation processes are very dependent on environmental conditions such as waves and currents that affect pipelines directly which will also affect the barge motion. Prior to the installation process, stress analysis will be the first to analyzed to know whether the stress that occurs on pipeline is save or not. In this study, with 109 m water depth, the most appropriate installation method is using S-Lay and the pipeline will be analyzed due to dynamic load. The dynamic load will determine that pipeline will occur any buckling that resulting to failure. Barge model will be modeled with MOSES while for the dynamic analysis will be modeled with OFFPIPE. When the stress number that occurs on pipeline is available, the analysis will be continue to local buckling analysis using DNV OS-F101 (2013) to know the occurance of local buckling along the 27 km pipeline. From this study, the maximum stress is 81.66% SMYS or 365.84 MPa in 109 m water depth with 0^{o} wave direction, so the stress along 27 km pipeline is bellow the allowable values based on DNV OS-F101 (2013) which 87% SMYS or 389.74 MPa. The highest unity check value for local buckling analysis is 0.738 in 109 m water depth. In conclusion the deeper the water the greater stress will occur on the pipeline and there is no occurance of local buckling along the 27 km pipeline.

Keywords : *Installation, Pipeline, Stress, Strain, Overbend, Sagbend,* dan *Local Buckling*.

KATA PENGANTAR

Assalamu'alaikum Wt. Wb.

Alhamdulillahirabbil 'alamin, segala puji bagi Allah SWT, TUHAN semesta alam, karea berkat limpahan rahmat dan karunia-Nya penulis dapat menyelesaikan tugas akhir ini dengan sebaik-baiknya. Tugas akhir ini berjudul "**Analisis *Local Buckling* Pipa Bawah Laut 20 inch pada saat Instalasi dengan Metode S-Lay di Blok DA dan BH, Selat Madura**"

Tugas akhir ini disusun dalam memenuhi salah satu persyaratan dalam menyelesaikan program pendidikan Strata 1 (S-1) di Jurusan Teknik Kelautan, Fakultas Teknologi Kelautan, Institut Teknologi Sepuluh Nopember. Semoga tugas akhir ini dapat menambah wawasan dan referensi untuk pembaca.

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Wassalamu'alaikum Wr. Wb.

Surabaya, Juli
2017

Febrianti

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DAFTAR ISI

DAFTAR TABEL

DAFTAR GAMBAR

DAFTAR LAMPIRAN

BAB I

PENDAHULUAN

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1.1 Latar Belakang Masalah

Pipa bawah laut atau *subsea pipelines* merupakan sarana utama transportasi minyak dan gas. Pipa bawah laut digunakan untuk mendistribusikan minyak dan gas bumi dari satu fasilitas ke fasilitas lainnya. Pada kondisi dan keadaan tertentu perlu perencanaan agar memberikan efisiensi yang lebih baik, sehingga investasi yang dihasilkan untuk instalasi pipa bawah laut dapat memberikan hasil yang maksimal.

Instalasi pipa bawah laut umumnya menggunakan metode S-Lay, J-Lay, dan *Reel Laying*. Instalasi pipa bawah laut ini sangat bergantung pada kondisi lingkungan seperti gelombang dan arus air laut yang nantinya langsung mengenai pipa sehingga akan berpengaruh pada gerakan *barge*. Pada analisa ini metode yang digunakan adalah metode S-Lay sehingga saat peletakan pipa dari *barge* ke dasar laut akan membentuk lengkungan seperti huruf S (*sagbend* dan *overbend*), maka terjadi *bending tension* maupun *bending compression*. Dengan adanya berbagai faktor hidrodinamis tersebut menyebabkan terjadinya tegangan pada pipa terutama pada bagian *overbend* dan *sagbend* (Soegiono, 2007).

Sebagai bagian dari proyek MDA, Husky-CNOOC Madura Limited (HCML) sedang mengembangkan cadangan gas Selat Madura Blok MDA/MBH *for sales to buyers* di Pulau Jawa. Lapangan ini terletak di lepas pantai Selat Madura, Jawa Timur, sekitar 180 kilometer sebelah Barat dari Pagerungan, sekitar 200 kilometer sebelah Timur dari Surabaya, dan 75 kilometer sebelah Tenggara dari Pulau Madura. Proyek ini akan mengembangkan:

a. Dua *wellhead platform* (MDA dan MBH)
b. 20 inch pipa dengan panjang 27 kilometer dari MDA ke MBH
c. Sebuah *offshore spread moored Floating Production Unit* (FPU), *tanker* yang dikonversi dengan fasilitas pengolahan gas
d. Jumper fleksibel dari MBH *wellhead platform* ke FPU

e. 14 inch pipa dengan panjang 3.7 km sebagai kelanjutan dari jumper fleksibel yang berasal dari FPU melalui MBH menuju pipa EJGP 28” yang telah tersedia.

Fasilitas pengolahan gas pada FPU didesain agar menghasilkan gas sejumlah 175 MMSCFD.

Setelah mendapatkan data *pipeline* maka selanjutnya adalah melihat apakah *properties* pipa yang didapatkan ada di lapangan. Untuk *schedule* pipa *wall thickness* sebesar 15.9 mm dan *outside diameter* sebesar 20 inch (508 mm) telah tersedia di lapangan.

Analisa pada Tugas Akhir ini akan difokuskan pada perhitungan tegangan yang terjadi pada pipa saat proses instalasi pada kondisi dinamis. Setelah didapatkan tegangan yang dialami pipa kemudian dihitung *local buckling* pada daerah *sagbend* dan *overbend* pada pipa saat proses instalasi.

1.2 Rumusan Masalah

Dari latar belakang di atas didapatkan permasalahan sebagai berikut:

1. Berapa nilai tegangan yang dialami daerah *sagbend* dan *overbend* pipa ketika proses instalasi?
2. Bagaimanakah *local buckling* yang terjadi di daerah *sagbend* dan *overbend* pipa ketika proses instalasi berdasarkan DNV OS F-101 2013?

1.3 Tujuan

Dari perumusan masalah di atas maka tujuan dari tugas akhir ini antara lain:

1. Mendapatkan nilai tegangan yang dialami pipa pada saat proses instalasi di daerah *sagbend* dan *overbend*.
2. Mengetahui keadaan pipa apakah mengalami *local buckling* selama proses instalasi.

1.4 Manfaat

Dari penelitian ini diharapakan dapat memberikan pemahaman mengenai proses instalasi pipa dengan metode S-LAY dan mengetahui berapa nilai tegangan yang dialami pipa, apakah dengan nilai tersebut pipa mengalami *local buckling* atau tidak.

1.5 Batasan Masalah

1. Analisa yang dilakukan adalah analisa dinamis dengan domain frekuensi
2. Beban lingkungan yang diperhitungkan adalah beban gelombang dan beban arus
3. Arah datang gelombang diasumsikan pada 0°, 45°, 90°, 135°, 180° terhadap *barge*.
4. Kedalaman divariasikan 109 meter, 101 meter, 91 meter, dan 80 meter.
5. Sistem penambatan (mooring) tidak dimodelkan
6. Bangunan atas *barge* tidak dimodelkan
7. Panjang *stinger* konstan.
8. *Stinger* dimodelkan sebagai *rigid extension* dari *barge*

(Halaman ini sengaja dikosongkan)

BAB II
TINJAUAN PUSTAKA DAN DASAR TEORI

BAB II
TINJAUAN PUSTAKA DAN DASAR TEORI

2.1 Tinjauan Pustaka

Pipa bawah laut merupakan suatu alat transportasi hidrokarbon dari satu tempat ke tempat lain. Umumnya, pipa bawah laut digunakan untuk memindahkan hidrokarbon dari *wellhead* atau *reservoir* menuju *production facility* (FPSO atau *platform*). Dalam pelaksanaannya, pipa bawah laut menjadi pilihan yang tepat karena tidak tergantung oleh cuaca. Namun proses desain, pemilihan bahan, dan proses instalasi harus diperhatikan dengan benar dan mengikuti aturan yang telah dibuat agar tingkat keamanannya terjaga.

Pada umumnya instalasi pipa bawah laut dilakukan oleh *laybarge*. Terdapat beberapa metode pemasangan pipa yaitu metode S-Lay, J-Lay, dan *Reel-lay*. Berdasarkan metode, pipa bawah laut mengalami pembebanan yang berbeda selama instalasi dari *lay barge*. Beban tersebut antara lain tekanan hidrostatis, *tension*, dan *bending* (Yong Bai, 2005). Analisis proses instalasi dilakukan untuk mengetahui apakah pipa akan mengalami kegagalan atau tidak. Dalam proses analisis instalasi pipa bawah laut terdapat beberapa faktor yang harus kita perhatikan. Terdapat dua kategori area yang harus dianalisa yaitu di area *overbend* dan *sagbend*.

Penelitian mengenai terjadinya *local buckling* pernah dilakukan Annisa (2015) tentang optimasi konfigurasi sudut *stinger* dan kedalaman laut dengan *local buckling check*. Namun penelitian tersebut dilakukan pada saat proses instalasi dengan kondisi statis. Rosyidi (2015) juga pernah melakukan penelitian mengenai *local buckling*, namun variasi dilakukan terhadap *radius curvature* saat proses instalasi.

Berdasarkan penelitian-penelitian yang telah dilakukan sebelumnya, maka penulis mengajukan studi kasus mengenai *local buckling* yang terjadi selama proses instalasi dengan kondisi dinamis. Dalam penelitian ini penulis melakukan analisis *local buckling* dengan variasi kedalaman air laut.

2.2 Dasar teori

2.2.1 Instalasi Pipa

Ada beberapa metode untuk menginstal pipa, metode yang paling umum adalah s-lay, j-lay, dan *reel laying*. Tiap-tiap metode memiliki keunggulannya masing-masing. Pipa bawah laut terkena berbagai macam beban selama instalasi. Secara umum, beban ini termasuk tekanan hidrostatik, *tension*, dan *bending*. Kemampuan kapal dalam meletakkan pipa tergantung dari berat pipa itu sendiri. Semakin besar kedalaman air, semakin besar pula berat pipa.

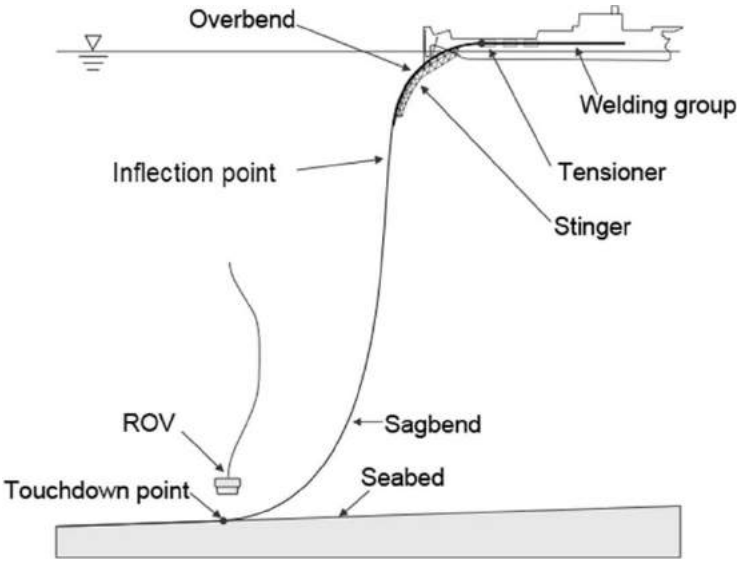
Program komputer komersial dapat digunakan sebagai alat yang efektif untuk analisis instalasi pipa dalam menganalisis konfigurasi statis dan dinamis. Program komputer yang biasa digunakan dalam analisis instalasi pipa adalah OFFPIPE.

Pada *laybarge* terdapat tempat untuk melakukan pengelasan (*welding station*), *tensioner*, NDT *station* dan *coating station*. *Roller* akan membantu pipa bergerak dari *barge* hingga masuk ke laut. *Roller* yang ditempatkan pada *stinger* dan *barge*, bersama dengan *tensioner* membentuk *curve support* untuk pipa. Pipa akan melengkung pada *curve support* ketika akan masuk kedalam laut sehingga pada bagian ini mengalami *bending* yang disebut *overbend*.

Tensioners akan mempertahankan tegangan konstan untuk menahan terjadinya *bending* yang berlebih dan mengimbangi gerakan dinamis *lay barge* di permukaan air laut. Mesin *tension* yang paling akhir biasanya terdapat pada bagian buritan pada *barge* yang letaknya berdekatan dengan *stinger*. Sehingga mesin *tension* ini berfungsi untuk mengatur *curvature sagbend* dan menjaga moment pada *stinger* saat pipa bergerak ke laut.

2.2.2 Metode Instalasi Pipa

a. Metode S-Lay



Gambar 2.1 Metode S-Lay (Yong Bai, 2014)

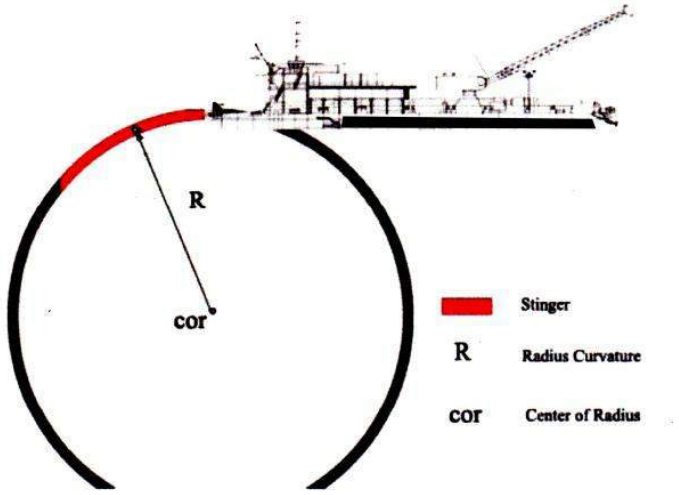
Metode s-lay yang diilustrasikan pada Gambar 2.1 adalah metode yang sering digunakan dalam instalasi pipa bawah laut di air yang relatif dangkal. Metode ini disebut demikian karena profil dari segmen pipa antara *stinger* dan dasar laut membentuk huruf S memanjang selama peletakkan pipa. *Stinger* adalah struktur rangka yang dilengkapi dengan *roller* yang berguna untuk mendukung pipa selama instalasi dan juga menciptakan kelengkungan pada pipa ketika berada di *overbending*. Radius kelengkungan dari *stinger* sesuai dengan *bending stress* maksimum.

Bagian pipa antara titik infleksi dan *stinger* disebut dengan wilayah *overbending*, sedangkan bagian pipa antara titik infleksi dengan dasar laut disebut wilayah *sagbending*.

- *Stinger*

  Stinger berfungsi sebagai pengarah pipa pada roller yang terletak antara tubular sehingga pipa dapat meluncur ke bawah dari buritan pada barge sampai ke seabed. Stinger yang berada pada buritan kapal tersebut membentuk radius curvature yang disebabkan oleh lengkungan pada stinger itu sendiri. Selain itu pada stinger tersebut dapat diubah-ubah kelengkungannya dengan menaik-turunkan roller-roller dengan

menggunakan pin yang berada pada stinger hingga membentuk radius curvature yang diinginkan. Stinger berbentuk melengkung yang merupakan bagian dari lingkaran dengan jari-jari yang biasa disebut radius curvature dan digunakan sebagai ukuran lengkung dari stinger. Pada Gambar 2.2 merupakan radius curvature dari lingkaran yang dihitung dari center of radius pada lingkaran sampai ke ujung lingkaran.



Gambar 2.2 Radius Curvature Stinger (Rosyidi, 2015)

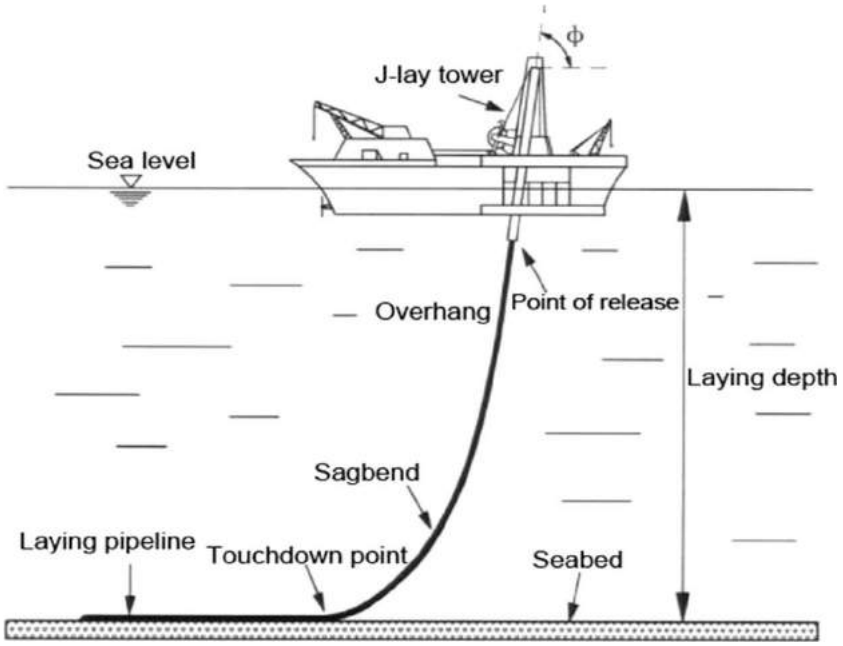
- Overbend

  Daerah overbend biasanya dimulai dari tensioner pada lay barge, melalui barge ramp, dan turun ke stinger sampai titik lift-off dimana pipa tidak lagi didukung oleh stinger. Pada daerah overbend ini diharapkan total regangan akibat dari berat pipa sendiri, moment bending pada tumpuan, atau roller tidak melebihi desain faktor yaitu 0.205 % untuk analisa statis dan 0.305% untuk analisa dinamis (berdasarkan DNV OS-F101 2013 sec. 13).

- Sagbend

  Daerah sagbend biasanya dimulai dari titik inflection sampai titik touch down pada seabed. Tegangan pada sagbend di kontrol oleh jari-jari stinger, departure angle dan pengaturan roller. Tegangan diharapkan kurang dari 87% SMYS (berdasarkan DNV OS-F101 2013 sec. 13).

b. Metode J-Lay

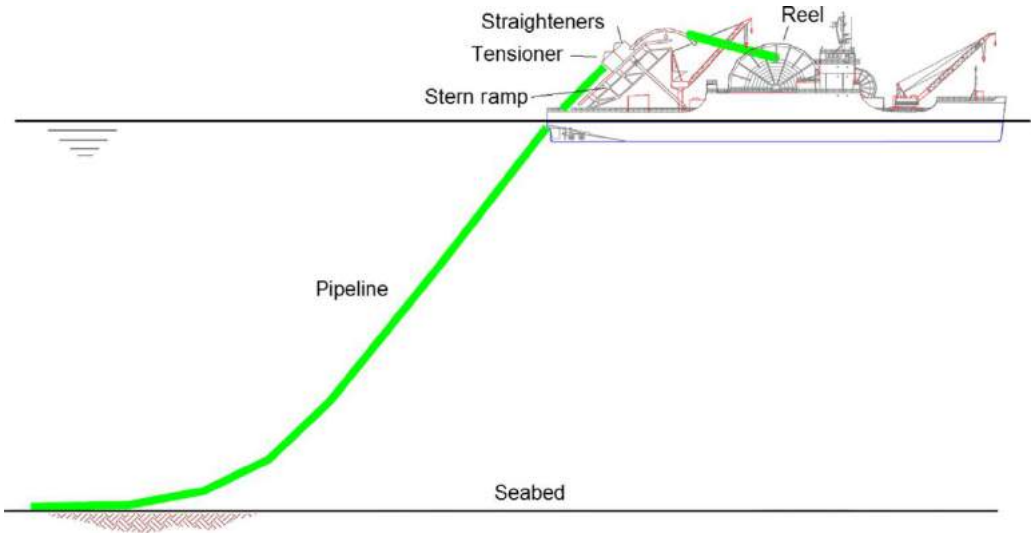


Gambar 2.3 Metode J-Lay (Yong Bai, 2014)

Metode J-lay yang diilustrasikan pada Gambar 2.3 sering digunakan dalam instalasi pipa di laut dalam dan telah menjadi metode utama instalasi pipa di laut dalam. Metode J-lay disebut demikian karena dari konfigurasi pipa menyerupai bentuk J selama instalasi.

Pada metode J-lay ini tidak terjadi *overbend* seperti yang terjadi pada metode S-lay, tidak ada *stinger* untuk menempatkan pipa dan pipa akan dilas dalam posisi mendekati vertikal yang kemudian akan diturunkan ke laut. Pada *barge* J-lay dilengkapi dengan *tower* yang digunakan untuk memposisikan pipa dan tempat penyambungan pipa. Karena semakin banyak jalur pipa yang terhubung secara bersamaan, *string* dibentuk dan diturunkan ke dasar laut. Oleh karena itu, metode J-lay secara inheren lebih lambat dibandingkan dengan metode S-lay dan juga lebih mahal.

c. Metode Reel Laying



Gambar 2.4 Metode *Reel Laying* (Yong Bai, 2014)

Metode *reel laying* yang diilustrasikan pada Gambar 2.4 adalah metode instalasi pipa yang baru muncul di akhir abad ke-20. Keuntungan dari metode ini adalah pipa dapat dihubungkan sepanjang mungkin di darat, kemudian digulung ke dalam sebuah drum yang dipasang pada kapal. Perangkat utama untuk metode instalasi pipa ini yaitu terdapatnya *reeling drum.*

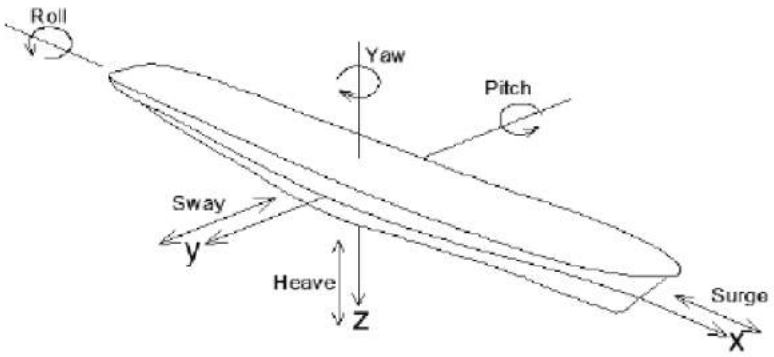
Pipa yang dipakai untuk metode ini tidak diselimuti dengan beton akan tetapi pipa harus tetap didisain supaya stabil setelah proses instalasi, hal ini dimaksudkan agar pipa dapat digulung dalam *reel*. Adapun selimut yang digunakan untuk melindungi pipa adalah digunakan bahan yang dapat digulung tanpa mengalami kerusakan seperti seperti jenis bahan *epoxy.*

2.2.3 Teori Dasar Gerakan Bangunan Apung

Bangunan apung (dalam hal ini *pipelay barge*) memiliki enam mode gerakan bebas (*Six Degree of Freedom*) yang terbagi menjadi dua kelompok, yaitu 3 mode gerakan translasional dan 3 mode gerakan rotasional dalam 3 arah sumbu (Bhattacharyya, 1978).

Seperti yang ditunjukkan pada Gambar 2.5, berikut adalah penjelasan keenam mode gerakan tersebut:

1. Mode Gerak Translasional
    a. *Surge*, gerakan transversal arah sumbu x
    b. *Sway*, gerakan transversal arah sumbu y
    c. *Heave*, gerakan transversal arah sumbu z
2. Mode Gerak Rotasional
    a. *Roll*, gerakan rotasional arah sumbu x
    b. *Pitch*, gerakan rotasional arah sumbu y
    c. *Yaw*, gerakan rotasional arah sumbu z



Gambar 2.5 Enam Derajat Kebebasan Gerakan Struktur Terapung (Hasanudin, 2015)

Dari Gambar 2.5 di atas dapat diketahui bahwa hanya 3 macam gerakan yang merupakan gerakan osilasi murni yaitu *heaving*, *rolling*, dan *pitching*, karena gerakan ini bekerja di bawah gaya atau momen pengembali ketika struktur itu terganggu dari posisi kesetimbangannya. Untuk gerakan *surging*, *swaying*, dan *yawing* struktur tidak kembali menuju posisi kesetimbangannya semula ketika terganggu, kecuali ada gaya atau momen pengembali yang menyebabkannya bekerja ke arah yang berlawanan.

2.2.4 Response Amplitude Operator (RAO)

Response Amplitude Operator (RAO) atau disebut juga dengan *transfer function* merupakan fungsi respon yang terjadi akibat gelombang dalam rentang frekuensi mengenai struktur. RAO merupakan alat untuk mentransfer gaya gelombang menjadi respon gerakan dinamis struktur.

RAO memuat informasi tentang karakteristik gerakan bangunan laut yang disajikan dalam bentuk grafik, dimana absisnya adalah parameter frekuensi, sedangkan ordinatnya adalah rasio antara amplitudo gerakan pada mode tertentu, ζ_{k0}, dengan amplitudo gelombang, ζ_0. Menurut Chakrabakti (1987), RAO dapat dicari dengan Persamaan 2.1 di bawah ini:

$$\text{RAO}(\omega) = \frac{\zeta_{k0}(\omega)}{\zeta_0(\omega)} \text{ (m/m)} \tag{2.1}$$

dengan:

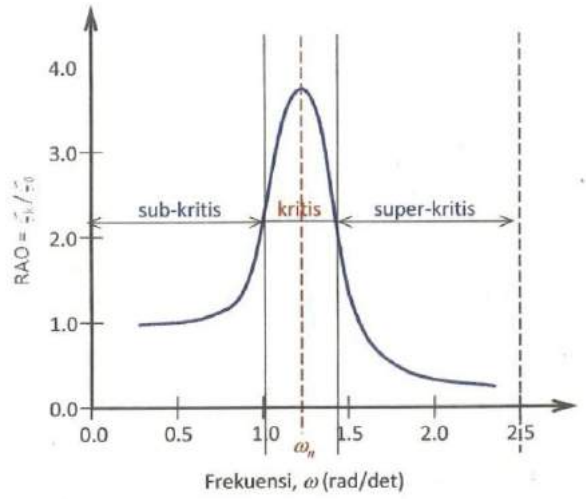
$\zeta_{k0}(\omega)$ = amplitudo struktur (m)

$\zeta_0(\omega)$ = amplitudo gelombang (m)

Respons gerakan RAO untuk gerakan translasi (*surge*, *sway*, *heave*) merupakan perbandingan langsung antara amplitudo gerakan dibandingkan dengan amplitudo gelombang insiden (keduanya dalam satuan panjang) (Djatmiko, 2012). Persamaan RAO untuk gerakan translasi sama dengan Persamaan 2.1 di atas.

Sedangkan untuk respons gerakan RAO untuk gerakan rotasi (*roll*, *pitch*, *yaw*) merupakan perbandingan antara amplitudo gerakan rotasi (dalam radian) dengan kemiringan gelombang, yakni yang merupakan perkalian antara gelombang ($k_w = \omega^2/g$) dengan amplitudo gelombang insiden (Djatmiko, 2012):

$$RAO(\omega) = \frac{\zeta_{k0}(\omega)}{\zeta_0(\omega)} = \frac{\zeta_{k0}}{(\omega^2/g)\zeta_0} \text{ (rad/rad)} \tag{2.2}$$



Gambar 2.6 Bentuk Umum Grafik Respons Gerakan Bangunan Apung (Djatmiko, 2012)

Berdasarkan Gambar 2.6 di atas, kurva respons gerakan bangunan apung pada dasarnya dapat dibagi menjadi tiga bagian:

- Pertama adalah bagian frekuensi rendah, atau gelombang (dengan periode) panjang, yang disebut daerah sub-kritis. Pada daerah ini bangunan laut akan bergerak mengikuti pola atau kontur elevasi gelombang panjang sehingga amplitudo gerakan kurang lebih akan ekuivalen dengan amplitudo gelombang, atau disebut sebagai *contouring*. Dalam korelasi persamaan hidrodinamis, di daerah frekuensi rendah, atau $\omega^2 < k/(m + a)$, gerakan akan didominasi oleh faktor kekakuan.
- Kedua adalah daerah kritis, meliputi pertengahan lengan kurva di sisi frekuensi rendah sampai dengan puncak kurva dan diteruskan ke pertengahan lengan kurva di sisi frekuensi tinggi. Puncak kurva berada pada frekuensi alami, yang merupakan daerah resonansi, sehingga respons gerakan mengalami magnifikasi, atau amplitudo gerakan akan beberapa kali lebih besar daripada amplitudo gelombang. Secara hidrodinamis di daerah frekuensi alami, yakni $k/(m + a) < \omega^2 < k/a$, gerakan akan didominasi oleh faktor redaman.
- Ketiga adalah daerah super kritis, yaitu daerah frekuensi tinggi, atau gelombang-gelombang (dengan periode) pendek. Pada daerah ini respons gerakan akan mengecil. Semakain tinggi frekuensi, atau semakin rapat antara puncak-puncak gelombang yang berurutan, maka akan memberikan

efek seperti bangunan laut bergerak di atas air yang relatif datar. Oleh karena itu gerakan bangunan laut diistilahkan sebagai *platforming*. Dalam hal korelasi hidrodinamis, gerakan di daerah frekuensi tinggi ini, dimana $\omega^2 < k/a$, gerakan akan didominasi oleh faktor massa (Djatmiko, 2012).

2.2.5 Respons Bangunan Apung pada Gelombang Acak (Spektra Respons)

Respons bangunan apung pada khususnya kapal yang diakibatkan oleh eksitasi gelombang acak telah diperkenalkan pertama kali oleh St. Denis dan Pierson (1953). Gerakan bangunan apung dalam kondisi ideal dapat dihitung sebagai reaksi adanya eksitasi gelombang sinusoidal, dengan karakterisitik tinggi atau amplitudo dengan frekuensi tertentu. Perhitungan kemudian dilakukan dengan mengambil amplitudo gelombang yang konstan, namun nilai frekuensinya divariasikan dengan interval kenaikkan tertentu.

Gelombang acak merupakan superposisi dari komponen-komponen pembentuknya yang berupa gelombang sinusoidal dalam jumlah tidak terhingga. Tiap-tiap komponen gelombang mempunyai tingkat energi tertentu yang dikontribusikan, yang kemudian secara keseluruhan diakumulasikan dalam bentuk spektrum energi gelombang (Djatmiko, 2012).

Dalam analisis respons bangunan apung pada gelombang reguler dapat diketahui pengaruh interaksi hidrodinamik pada massa tambah, *potential damping*, dan gaya eksternal. Analisis tersebut menghasilkan respons struktur pada gelombang reguler. Respons struktur pada gelombang acak dapat dilakukan dengan mentransformasikan spektrum gelombang menjadi spektrum respons. Spektrum respons didefinisikan sebagai respons kerapatan energi pada struktur akibat gelombang. Hal ini dapat dilakukan dengan mengalikan nilai pangkat kuadrat dari *Response Amplitude Operator* (RAO) dengan spektrum gelombang pada daerah struktur bangunan apung tersebut beroperasi. Persamaan respons struktur yang diilustrasikan pada Gambar 2.7 secara matematis dapat dituliskan seperti Persamaan 2.3 di bawah ini:

$$S_R = [\mathrm{RAO}(\omega)]^2 \times S(\omega) \tag{2.3}$$

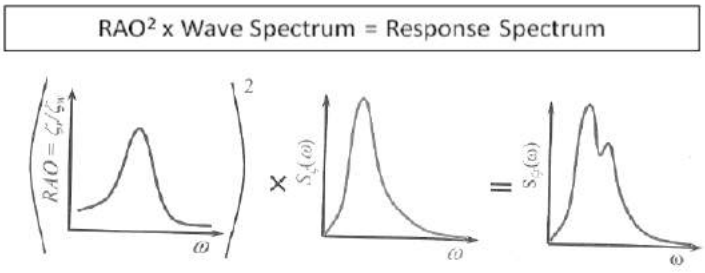
dengan:

S_R = Spektrum Respons (m^2-sec)

$S(\omega)$ = Spektrum Gelombang (m^2-sec)

RAO(ω) = *Transfer Function*

ω = Frekuensi Gelombang (rad/sec)



Gambar 2.7 Transformasi Spektra Gelombang menjadi Spektra Respons (Djatmiko, 2012)

2.2.6 Spektrum Gelombang

Spektrum gelombang laut diperlukan untuk mengetahui karakteristik dari gelombang di permukaan laut. Bentuk-bentuk spektrum gelombang laut dapat digunakan untuk menentukan periode puncak gelombang dan panjang gelombang. Spektrum gelombang laut yang sering digunakan antara lain spektrum Pierson-Moskowitz, spektrum JONSWAP (*Joint North Sea Wave Project*) dan spektrum ITTC ISSC. Bentuk spektrum gelombang laut dapat diketahui melalui data periode gelombang. Dengan mengumpulkan data frekuensi gelombang yang dapat dihitung dari periode gelombang ke dalam masing-masing fungsi kerapatan spektral, maka dapat diperoleh periode puncak spektrum. Melalui persamaan gelombang yang memberikan hubungan antara panjang gelombang dan suatu periode gelombang maka diperoleh panjang gelombang pada saat periode gelombang puncak.

Pada tugas akhir ini, dalam analisisnya akan diunakan spektrum gelombang JONSWAP. JONSWAP merupaka proyek yang dilakukan di perairan *North Sea*. Berdasrkan DNV RP-C205 (2014), formulasi spektrum JONSWAP merupakan modifikasi dari spektrum *Pierson-Moskowitz*. Spektrum JONSWAP mendeskripsikan angin yang mengakibatkan gelombang dengan kondisi *seastate* yang ekstrim. Kriteria dalam DNV RP-C205, n=bahwa spektrum JONSWAP dapat diaplikasikan untuk perairan dengan:

$$3.6 < T_p/(H_s)^{1/2} < 5 \qquad (2.4)$$

Persamaan spektrum JONSWAP (DNV RP-F105) dapat dilihat pada Persamaan 2.5 berikut:

$$S_{(\omega)} = \alpha . g^2 \omega^2 \exp\left[-1{,}25\ (\omega/\omega_p)^{-4}\right] \gamma^{\exp\left[0{,}5\left(\frac{\omega-\omega_p}{\sigma\omega_p}\right)^2\right]} \qquad (2.5)$$

dengan:

α = $\frac{5}{16}\frac{H_s{}^2 \omega_p{}^4}{g^2}(1 - 0{,}287 \ln\gamma)$

σ = *Spectral Width Parameter*

= 0,07 jika $\omega \leq \omega_p$

= 0,09 jika $\omega > \omega_p$

ω_p = Angular Spectral Frequencies (rad/s)

= $2\pi/T_p$

ω = Wave Frequencies (rad/s)

= $2\pi/T$

H_s = Tinggi Gelombang Signifikan (m)

T_p = Peak Periode (s)

T = Periode Gelombang (s)

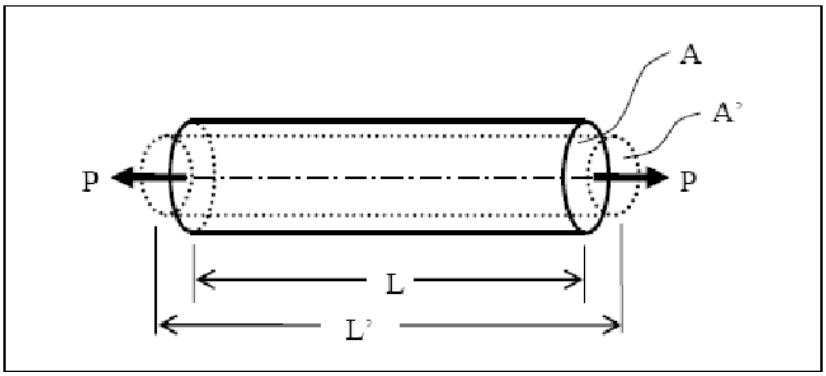
Nilai Peakedness Parameter dapat dicari dengan menggunakan Persamaan 2.6 di bawah ini:

$$\gamma = \begin{cases} 5 & \varphi \leq 3.6 \\ \exp(5.75 - 1.15\varphi) & 3.6 < \varphi < 5 \\ 1 & \varphi \geq 5 \end{cases} ;\ \varphi = \frac{T_p}{\sqrt{H_s}} \qquad (2.6)$$

Formulasi spektrum JONSWAP sering digunakan dalam perancangan dan analisis bangunan lepas pantai yang beroperasi di Indonesia. Hal ini dikarenakan perairan di Indonesia adalah perairan kepulauan atau perairan tertutup. Namun, berdasarkan kajian-kajian yang ada, dalam melakukan analisis bangunan lepas pantai yang dioperasikan di Indonesia, maka nilai parameter γ yang dipakai sekitar $2 - 2{,}5$ untuk mengurangi dominasi energi yang dikontribusikan oleh frekuensi gelombang tertentu saja.

2.2.7 Tegangan Normal

Pipa bawah laut dapat mengalami *axial force* seperti ditunjukkan pada Gambar 2.8 berikut ini:



Gambar 2.8 Pembebanan Aksial pada Batang Tubular

(Gere dan Timoshenko, 2009)

Tegangan yang terjadi dapat berupa tegangan tarik (*tensile stress*) atau tegangan tekan (*compressive stress*). Pada gambar di atas, ditunjukkan *tensile stress* dimana tegangan ini akan menyebabkan *normal stress*. Tegangan Normal adalah tegangan yang bekerja dalam arah tegak lurus terhadap bidang yang dapat dihitung dengan Persamaan 2.7 berikut: (2.7)

$$\sigma = \frac{P}{A}$$

dengan:

σ = tegangan normal (N/m^2)

P = gaya tarik atau tekan (N)

A = luas penampang melintang (m^2)

Pada Gambar 2.8 batang tubular dengan luas penampang A dan panjang L mengalami pembebanan aksial akibat gaya tarik P. Akibat gaya ini, batang akan mengalami perubahan panjang sebesar:

$$\Delta L = L' - L \quad (2.8)$$

dengan:

ΔL = pertambahan panjang (m)

L = panjang batang semula (m)

L’ = panjang batang setelah menerima beban (m)

Perbandingan antara pertambahan panjang (ΔL) dengan panjang mula-mula disebut sebagai regangan aksial dan dirumuskan sebagai berikut:

$$\varepsilon = \frac{\Delta L}{L} \tag{2.9}$$

Hal ini berarti jari-jari penampangnya juga mengalami perubahan dari R menjadi R'. Regangan ini disebut dengan regangan aksial dan secara matematis dirumuskan sebagai berikut:

$$\varepsilon = \frac{R' - R}{R} \tag{2.10}$$

dengan:

ε = *axial strain* (m)

R = jari-jari penampang semula (m)

R′ = jari-jari penampang setelah menerima beban (m)

Perbandingan antara regangan radial dengan regangan aksial disebut sebagai poisson's ratio. Secara matematis, poisson's ratio dapat dirumuskan seperti pada Persamaan 2.11:

$$\mathrm{v} = \frac{\varepsilon'}{\varepsilon} \tag{2.11}$$

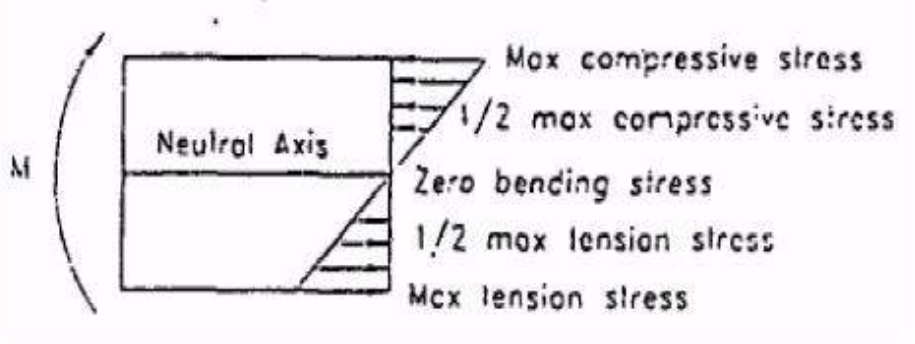
dengan:

ε = *axial strain* (m)

ε = *radial strain* (m)

2.2.8 Tegangan Tekuk

Tegangan tekuk (σ_b) adalah tegangan yang ditimbulkan oleh momen (M) yang bekerja pada ujung-ujung pipa. Dalam hal ini tegangan yang terjadi dapat berupa tegangan tekuk tekan (tensile bending) atau tegangan tekuk tarik (compression bending). Tegangan tekuk, maksimum pada permukaan pipa (c) dan minimum (nol) pada sumbu pipa, karena tegangan tersebut merupakan fungsi jarak dari sumbu ke permukaan pipa. Hal ini digambarkan pada Gambar 2.9 sebagai berikut:



Gambar 2.9 Ilustrasi Tegangan Tekuk Maksimal dan Tegangan Tekuk Minimal

Tegangan tekuk secara matematis, dirumuskan seperti Persamaan 2.12 berikut:

$$\sigma_b = \frac{M_c}{I} \tag{2.12}$$

dimana:

I = Momen inersia penampang (m^4)

$= \frac{\pi(r_0{}^4 - r_i{}^4)}{4}$

2.2.9 Tegangan Geser

Tegangan geser (*shear stress*) adalah tegangan yang bekerja dalam arah tangensial terhadap permukaan bahan. Dimana tegangan geser, secara matematis dapat dirumuskan seperti pada Persamaan 2.13 berikut:

$$\tau = \frac{v}{A} \tag{2.13}$$

dengan:

τ = tegangan geser (N/m^2)

v = gaya geser (N)

A = luas penampang melintang (m^2)

Tegangan geser yang bekerja pada suatu elemen bahan disertai regangan geser. Tegangan geser tidak mempunyai kecenderungan untuk memperpanjang atau memperpendek elemen arah x, y, dan z. Ini berarti panjang sisi elemen tidak berubah, oleh karenanya tegangan geser tidak menyebabkan perubahan bentuk elemen.

2.2.10 *Hoop Stress*

Dalam pemilihan tebal pipa, pertimbangan tebal material untuk menahan perbedaan tekanan dari luar dan dari dalam yang disebut dengan *hoop stress* (Gambar 2.10) adalah sangat penting. Adapun formulasi untuk menghitung *hoop stress* berdasarkan DNV OS-F101 adalah seperti Persamaan 2.14 berikut:

$$\sigma_h = (P_i - P_e)\frac{D-t}{2t} \tag{2.14}$$

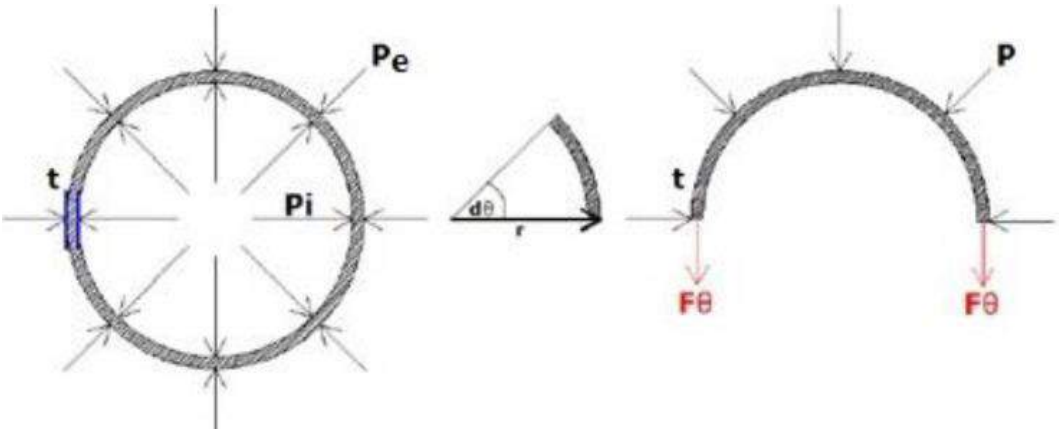
dimana:

P_i = *Internal Pressure* (MPa)

P_e = *External Pressure* (MPa)

D = *Outside Diameter of Linepipe* (m)

t = *Nominal Wall Thickness* (m)



Gambar 2.10 Ilustrasi Tekanan Internal (Pi) dan Tekanan Eksternal (Pe) pada Pipa Bawah Laut (Pratama, 2007)

2.2.11 Tegangan Longitudinal (*Longitudinal Stress*)

Tegangan longitudinal yang diilustrasikan pada Gambar 2.11 adalah tegangan yang dipengaruhi oleh gaya yang diakibatkan oleh beban lingkungan. Adapun formulasi untuk menghitung *longitudinal stress* berdasarkan DNV OF-F101 adalah seperti Persamaan 2.15 berikut:

$$\sigma_l = \frac{N}{\pi(D-t)t} + \frac{M}{\frac{\pi(D^4-(D-2t)^4)}{32D}} \tag{2.15}$$

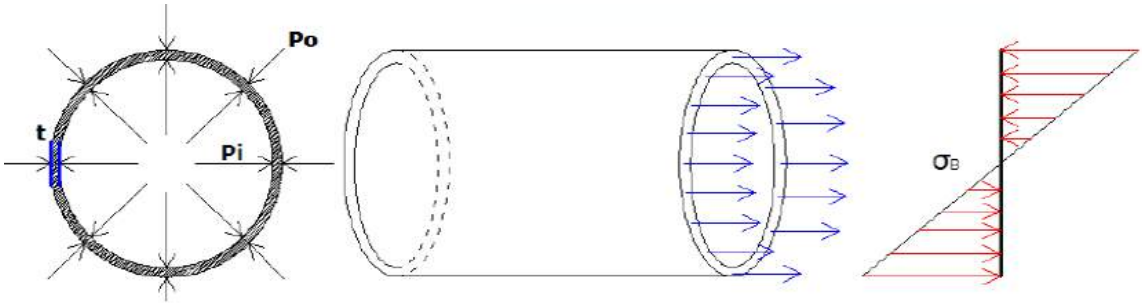
dimana,

N = *Pipe Wall Force* (N)

M = *Bending Moment* (kN-m)

D = *Outside Diameter of Linepipe* (m)

t = *Nominal Wall Thickness* (m)



Gambar 2.11 Ilustrasi *Longitudinal Stress* pada Pipa (Pratama, 2007)

2.2.12 Tegangan Ekuivalen (*Von Misses Stress*)

Setelah mendapatkan hoop stress dan longitudinal stress maka tegangan ekuivalen dapat dicari. Untuk mencari tegangan ekuivalen, kita menggunakan formulasi Von Misses Stress yang terdapat dalam DNV OS-F101, seperti yang ditunjukkan pada Persamaan 2.16 di bawah ini:

$$\sigma_e = \sqrt{\sigma_h^2 + \sigma_l^2 - \sigma_h \sigma_l + 3\tau_{hl}^2} \qquad (2.16)$$

dimana,

σ_e = *Equivalent Stress* (MPa)

σ_l = *Longitudinal Stress* (MPa)

σ_h = *Hoop Stress* (MPa)

τ_{hl} = *Tangential Shear Stress* (MPa)

2.2.13 Analisis Dinamis

Menurut Chakrabhakti ada dua pendekatan dasar yang dipertimbangkan dalam menganalisa masalah struktur terapung, yaitu dengan metode *frequency domain* dan *time domain*. *Frequency domain* biasanya dilakukan untuk penyelesaian yang sederhana. Solusi pada metode ini diperoleh menlalui pendekatan persamaan diferensial. Keterbatasan dari metode ini adalah semua persamaan non-linier harus diubah dalam bentuk persamaan linier.

Sedangkan untuk metode *time domain* menggunakan pendekatan integrasi numeris dari persamaan gerak dari semua sistem non-linier. Beberapa contoh persamaan yang menggunakan analisa non-linier adalah gaya drag, gaya pada *mooring*, dan viskositas *damping*.

Dalam *American Petroleum Institute* 1987 API RP 2T membagi analisa dinamis kedalam 2 metode analisa domain, yaitu:

a. *Frequency domain analysis* adalah simulasi kejadian pada saat tertentu dengan interval frekuensi yang telah ditentukan sebelumnya. Domain frekuensi juga dapat digunakan untuk memperkirakan respon gelombang acak termasuk gerakan *platform* dan percepatan, gaya tendon dan sudut. Keuntungannya adalah lebih menghemat waktu perhitungan dan juga input atau output-nya sering digunakan oleh persancang. Kekurangan dari metode ini adalahsemua persamaan non-linier harus diubah dalam bentuk linier.

b. *Time domain analysis* adalah penyelesaisan gerakan dinamis struktur berdasarkan fungsi waktu. Pendekatan yang digunakan dalam metode ini menggunakan prosedur integrasi waktu dan akan menghasilkan respon *time history* berdasarkan waktu x(t).

   Keuntungan dari metode *time domain* dibandingkan metode *frequency domain* adalah semua tipe non-linier (*matrix system* dan beban-beban eksternal) dapat dimodelkan dengan lebih tepat. Kekurangannya adalah memerlukan waktu yang panjang dalam pengerjaannya. Simulasi *time domain* dapat dikerjakan menurut beberapa skema integrasi. Untuk dapat mewakili kondisi sebenarnya simulasi dilakukan minimal tiga jam.

2.2.14 Allowable Stress and Strain Criteria

Pada saat proses instalasi berlangsung, tegangan yang terjadi pada pipa tidak boleh melebihi tegangan yang diizinkan. Jenis material pipa yang digunakan dalam penelitian ini adalah *linepipe* API 5L X65. Berikut ini kriteria tegangan dan regangan yang diizikan berdasarkan DNV OS-F101:

1. Regangan yang diizinkan pada wilayah *overbend*

   Analisa statis = 0.205%

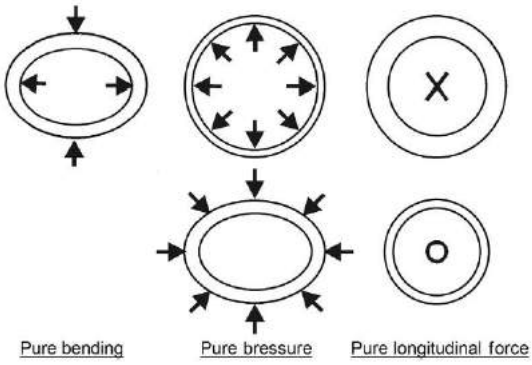
   Analisa dinamis = 0.305%

2. Tegangan yang diizinkan pada wilayah *sagbend* dan *stinger tip*

   σ_{eq} ≤ 87% SMYS

2.2.15 Buckling

Penekukan (*buckling*) pada pipa yang diiustrasikan dengan Gambar 2.12 dapat didefinisikan sebagai perubahan deformasi (*ovaling*) pada penampang pipa yang terjadi pada satu atau seluruh bagian pipa. Dengan kata lain *buckling* terjadi dalam keadaan dimana pipa sudah mengalami perubahan bentuk akibat tekanan hidrostatis yang besar pada kedalaman tertentu. Kemungkinan terjadinya *buckling* pada suatu struktur *pipeline* harus dipertimbangkan untuk menghindari kegagalan pada pipa. Analisa *buckling* dibagi menjadi dua bagian yaitu *local buckling* dan *global buckling*. *Local buckling* merupakan suatu kondisi dimana terjadi deformasi bentuk pada penampang melintang suatu pipa. Analisis *local buckling* dilakukan untuk kodisi instalasi, hal ini disebabkan karena proses instalasi merupakan kondisi paling kritis terjadinya *local buckling* akibat adanya *eksternal pressure, axial force,* dan *bending moment*.



Gambar 2.12 Penampang pipa yang Terdeformasi akibat Beban

(Yong Bai, 2014)

Berdasarkan DNV OS-F101, dalam melakukan analisis *local buckling* yang terjadi pada pipa, harus memenuhi beberapa kriteria, yaitu:

1. Kriteria System Collapse.

Semakin dalam suatu perairan, maka tekanan yang terjadi juga akan semakin besar. Hal ini yang harus dipertimbangkan oleg para perancang pipa bawah laut agar nantinya ketika pipa beroperasi pada kedalaman tertentu, tekanan eksternal yang melebihi tekanan internal pipa tidak dapat mengakibatkan *collapse*. *Collapse* pada dinding pipa dapat terjadi tergantung pada berbagai faktor, termasuk rasio antara diameter terhadap ketebalan pipa (D/t), karakteristik tegangan dan regangan material, dan ovalisasi.

Berdasarkan DNV OS-F101, karakteristik tahanan untuk tekanan collapse (P_c) ditentukan dengan Persamaan 2.17 berikut:

$$\left(P_c(t) - P_{el}(t)\right).\left(P_c(t)^2 - P_{el}(t)^2\right) = P_c(t).P_{el}(t).P_p(t).f_0\frac{D}{t} \quad (2.17)$$

dengan:

$$P_{el}(t) = \frac{2.E.\left(\frac{t}{D}\right)^3}{1-v^2} \quad (2.18)$$

$$P_p(t) = f_y.\alpha_{fab}\frac{2t}{D} \quad (2.19)$$

$$f_0 = \frac{D_{max}-D_{min}}{D} \quad (2.20)$$

dimana,

P_c = Karakteristik Tekanan *Collapse* (MPa)

P_{el} = Tekanan *Collapse* Elastis (MPa)

P_p = Tekanan *Collapse* Plastis (MPa)

f_0 = *Ovality*, ($0.5\% \leq f_0 \leq 1.5\%$)

α_{fab} = Faktor Fabrikasi (Tabel 2.1)

D_{max} = Diameter pipa terbesar yang diukur (m)

D_{min} = Diameter pipa terkecil yang diukur (m)

t = *Nominal Wall Thickness* (m)

E = *Young's Modulus*

v = *Poisson ratio* (0.3)

Faktor fabrikasi maksimum (α_{fab}) untuk pembuatan pipa dapat dilihat pada Tabel 2.1 berikut:

Tabel 2.1 Faktor Fabrikasi Maksimum (DNV OS-F101 Sec. 5)

Pipe	Seamless	UO & TRB & ERW	UOE
α_{fab}	1.00	0.93	0.85

dimana,

UO : Proses fabrikasi untuk *welded pipe*

TRB : *Three rolling bending*

ERW : *Electrical resistance welded pipe*

UOE : Proses fabrikasi untuk *welded pipe-expanded*

Persamaan 2.17, tekanan *collapse* (Pc) merupakan persamaan polinomial derajat tiga, untuk itu dilakukan pendekatan nilai Pc dengan Persamaan 2.21 – 2.28:

$$P_c = y - \frac{1}{3}b \tag{2.21}$$

dengan:

$$b = -P_{el} \tag{2.22}$$

$$y = -2\sqrt{-u}\cos\left(\frac{\phi}{3} + \frac{60\pi}{180}\right) \tag{2.23}$$

$$c = -(P_p + P_p P_{el} f_0 \frac{D}{t}) \tag{2.24}$$

$$d = P_{el} + {P_p}^2 \tag{2.25}$$

$$u = \frac{1}{3}\left(-\frac{1}{3}b^2 + c\right) \tag{2.26}$$

$$v = \frac{1}{2}\left(\frac{2}{27}b^3 - \frac{1}{3}bc + d\right) \tag{2.27}$$

$$\phi = cos^{-1}\left(\frac{-v}{\sqrt{-u^3}}\right) \tag{2.28}$$

Sesuai dengan DNV OS-F101, tekanan eksternal yang terjadi di sepanjang pipa harus memenuhi kriteria pada Persamaan 2.29 di bawah ini (cek sistem *collapse*):

$$P_e - P_{min} \leq \frac{P_c(t_1)}{\gamma_m \gamma_{SC}} \tag{2.29}$$

dengan:

Pmin = Tekanan Internal Minimum (untuk kasus instalasi pipa bawah laut bernilai 0 MPa)

γ_m = *Material Resistance Factor* (Table 2.2)

γ_{SC} = *Safety Class Resistance Factor* (Tabel 2.3)

Tabel 2.2 *Material Resistance Factor* (DNV OS-F101 Sec. 5)

Limit state category	SLS/ULS/ALS	FLS
γ_m	1.15	1.00

Tabel 2.3 *Safety Class Resistance Factor* (DNV OS-F101 Sec.5)

	γ_{SC}		
Safety class	Low	Medium	High
Pressure containment	1.046	1.138	1.308
Other	1.04	1.14	1.26

1. Kriteria Combined Loading.

Kriteria ini menunjukkan syarat kekuatan pipa bawah laut terhadap semua gaya dan tekanan yang diterima pipa. Gaya dan tekanan yang dimaksud yaitu kombinasi pembebanan terhadap *design bending moment*, *design effective axial force*, tekanan internal dan eksternal, tekanan pada *pressure containment*, tekanan *collapse*, dan karakteristik tahanan gaya aksial plastis. Berdasarkan DNV OS-F101 : *Submarine Pipeline System*, kriteria ini akan diperiksa terhdapa dua kondisi, yaitu:

a. Tekanan Internal Berlebih (*Internal Overpressure*)

Pada kondisi ini kekuatan pipa akan diperiksa terhadap tekanan internal yang terjadi. Tekanan ini dipengaruhi oleh tekanan fluida pengisi (*pressure containment*) serta tahanan aksial dari pipa. Berdasarkan DNV OS-F101, kriteria ini harus memenuhi Persamaan 2.30 berikut ini:

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c . M_p(t_2)} + \left\{\frac{\gamma_m . \gamma_{SC} . S_{Sd}(P_i)}{\alpha_c . S_p(t_2)}\right\}^2\right\}^2 + \left(\alpha_p . \frac{P_i - P_e}{\alpha_c . P_b(t_2)}\right)^2 \leq 1 \quad (2.30)$$

Digunakan untuk:

$15 \leq {}^{D}/_{t_2} \leq 45$, $P_i \geq P_e$, $|S_{Sd}|/S_p < 0.4$

$$S_p(t) = f_y . \pi . (D - t) . t \quad (2.31)$$

$$M_p(t) = f_y . \pi . (D - t)^2 . t \quad (2.32)$$

$$\alpha_c = (1 - \beta) + \beta \frac{f_u}{f_y} \quad (2.33)$$

$$\alpha_p = \begin{cases} 1 - \beta & \frac{P_i - P_e}{P_b} < \frac{2}{3} \\ 1 - 3\beta\left(1 - \frac{P_i - P_e}{P_h}\right) & \frac{P_i - P_e}{P_h} \geq \frac{2}{3} \end{cases} \quad (2.34)$$

$$\beta = \frac{60 - {}^{D}/_{t_2}}{90} \quad (2.35)$$

$$M_{Sd} = M_F.\gamma_F.\gamma_C + M_E.\gamma_E + M_I.\gamma_F.\gamma_C + M_A.\gamma_A.\gamma_C \quad (2.36)$$

$$S_{Sd} = S_F.\gamma_F.\gamma_C + S_E.\gamma_E + S_I.\gamma_F.\gamma_C + S_A.\gamma_A.\gamma_C \quad (2.37)$$

Untuk nilai faktor beban (γ_f, γ_E, γ_F, γ_A) dan faktor kondisi pembebanan (γ_C) dapat dilihat pada Tabel 2.4 dan Tabel 2.5 di bawah ini:

Tabel 2.4 *Load Effect Factor Combinations* (DNV OS-F101 Sec.4)

Limit State/ Load combination	Load effect combination		Functional loads	Environmental loads	Interference loads	Accidental loads
			γ_F	γ_E	γ_F	γ_A
ULS	*a*	System check	1.2	0.7		
	b	Local check	1.1	1.3	1.1	
FLS	*c*		1.0	1.0	1.0	
ALS	*d*		1.0	1.0	1.0	1.0

Tabel 2.5 *Conditions Load Effect Factor* (DNV OS-F101 Sec.4)

Condition	γ_C
Pipeline resting on uneven seabed	1.07
Reeling on and J-tube pull-in	0.82
System pressure test	0.93
Otherwise	1.00

b. Tekanan Eksternal Berlebih (*External Overpressure*)

Pada kondisi ini, kekuatan pipa akan diperiksa berdasarkan tekanan eksternal yang terjadi. Tekanan ini sangat dipengaruhi oleh tekanan eksternal terhadap pipa. Tahanan dari kondisi tersebut diantaranya adalah tekanan *collapse*. Berdasarkan DNV OS-F101, kriteria ini harus memenuhi Persamaan 2.38 berikut:

$$\left\{\gamma_m.\gamma_{SC}\frac{|M_{Sd}|}{\alpha_c.M_p(t_2)} + \left\{\frac{\gamma_m.\gamma_{SC}.S_{Sd}}{\alpha_c.S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m.\gamma_{SC}.\frac{P_e - P_{\min}}{P_c(t_2)}\right)^2 \leq 1 \quad (2.38)$$

Digunakan untuk:

$15 \leq {}^{D}/_{t_2} \leq 45$, $P_i \geq P_e$, $|S_{Sd}|/S_p < 0.4$

dimana,

M_f = Momen bending desain, kN-m (Pers. 2.36)

S_f = Gaya aksial efektif desain, kN (Pers. 2.37)

M_p = Tahanan momen plastis, kN-m (Pers.2.32)

S_p = Tahanan aksial plastis, kN (Pers. 2.31)

P_c = Collapse pressure, MPa

P_{min} = Tekanan internal minimum, MPa

P_e = Tekanan eksternal, MPa

a_c = Parameter *flow stress*, (Pers. 2.33)

γ_m = *Material resistance factor*, (Tabel 2.2)

γ_{SC} = *Safety class resistance factor*, (Tabel 2.3)

t_2 = *Nominal wall thickness*, m

2. Kriteria Propagation Buckling.

Propagation buckling adalah deformasi bentuk pada penampang melintang pipa yang kemudian berubah menjadi *buckle* yang memanjang dan merambat di sepanjang pipa. Penyebab utama dari *propagation buckling* ini adalah tekanan eksternal (hidrostatik) yang nilainya lebih besar dari tekanan yang diperlukan untuk mencegah terjadinya perambatan *buckle* tersebut. Terjadinya *propagation buckling* didahului oleh adanya *local buckling* dan tidak bisa menjalar ke bagian lain jika tekanan eksternal masih di bawah tekanan propagasi (P_{pr}).

Berdasarkan DNV OS-F101 : *Submarine Pipeline Systems*, nilai tekanan *propagation buckling* dapat ditentukan dengan menggunakan Persamaan 2.39 berikut ini:

$$P_{pr} = 35.f_y.\alpha_{fab}\left(\frac{t_2}{D}\right)^{2.5} \quad (2.39)$$

dengan:

P_{pr} = Propagation buckling (N/m2)

a_{fab} = Faktor fabrikasi (Tabel 2.1)

Berdasarkan DNV OS-F101, kriteria pengecekkan terhadap propagation buckling dinyatakan dalam Persamaan 2.40 berikut ini:

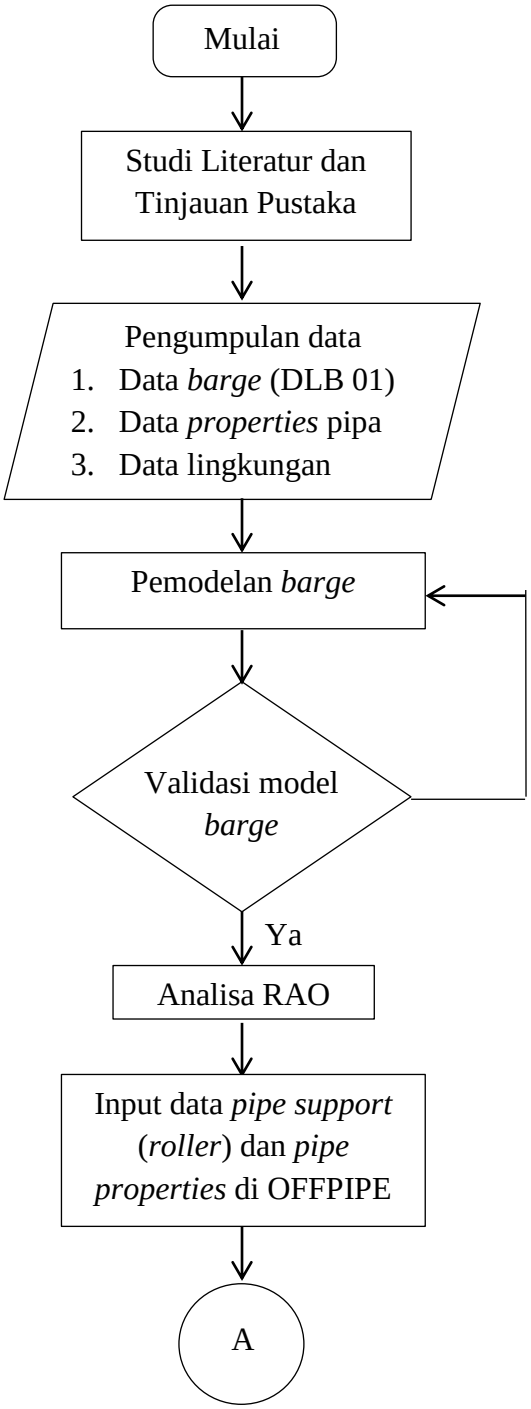
$$P_e - P_{\min} \leq \frac{P_{pr}}{\gamma_m.\gamma_{SC}} \quad (2.40)$$

BAB III

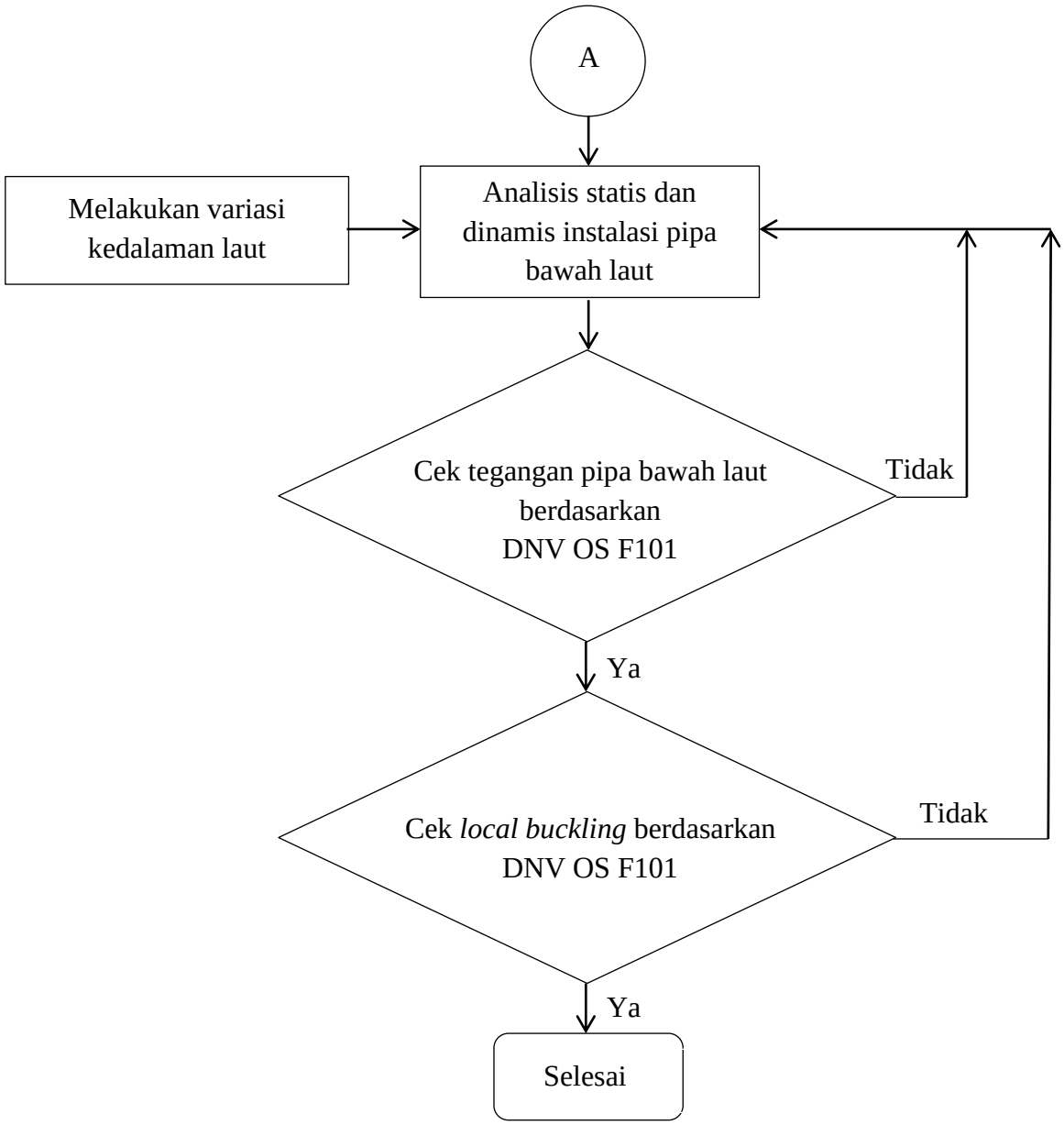
METODOLOGI PENELITIAN

BAB III
METODOLOGI PENELITIAN

3.1 Skema Diagram Alir



Gambar 3.1 Alur Pengerjaan secara Umum



Gambar 3.1 Alur Pengerjaan secara Umum (lanjutan)

3.2 Prosedur Penelitian

Untuk menyelesaikan permasalahan dalam studi kasus ini diperlukan langkah-langkah urutan pengerjaan yang harus dicapai, antara lain:

1. Studi literatur dan tinjauan pustaka

Mengumpulkan referensi (sumber pustaka) berupa buku, jurnal, penelitian, *codes*, maupun standard yang berhubungan dengan studi kasus ini. Penelitian sebelumnya pernah dilakukan oleh Rezha Eka 2016, Mutiara dan Mahfud pada tahun 2015, Rudy pada tahun 2014, dan Armando pada tahun 2011.

2. Pengumpulan data pipa, data *stinger*, *barge*, dan data lingkungan

Pada kasus ini keseluruhan data diambil dari Husky-CNOOC Madura Limited yang sedang mengembangkan cadangan gas Selat Madura Blok DA dan BH.

3. Pemodelan *barge*

Membuat pemodelan *barge* DLB 01 pada *software* MOSES berdasarkan data-data yang diperoleh. Pemodelan ini adalah saat *barge* dalam kondisi *free floating.*

4. Validasi model *barge*

Validasi *barge* dilakukan dengan membandingkan hasil pemodelan *barge* antara *software* MOSES dan data *barge* yang ada di lapangan. Parameter yang digunakan adalah LOA (*length over all*), *breadth*, *depth*, *draft*, *displacement*, GMT, dan GML *barge* dimana berdasarkan IACS, kriteria validasi *displacement* sebesar 2% dan untuk parameter lain maksiman 1%.

5. Analisa RAO

RAO ini menggambarkan karakteristik gerakan *barge* pada gelombang acak. Untuk memperoleh RAO, dilakukan *input center of gravity* (x, y, z) dan nilai jari-jari girasi (K_{xx}, K_{yy}, K_{zz}). *Running* input yang sudah dimasukkan ke dalam *software* OFFPIPE untuk mendapatkan tegangan yang dialami pipa di daerah *sagbend* dan *overbend* pada kondisi dinamis.

6. Input data pipe support (roller) dan pipe properties di OFFPIPE

Memasukkan koordinat *roller* yang berada pada *barge* dan *stinger* serta memasukan data properti pipa.

7. Input data lingkungan

Memasukkan input data lingkungan untuk mengetahui efek kondisi lingkungan (gelombang dan arus) saat proses instalasi berlangsung.

8. Analisis dinamis instalasi pipa bawah laut

Dalam analisis ini, dilakukan permodelan instalasi pipa bawah laut dengan melakukan variasi kedalaman laut.

9. Cek tegangan pada pipa bawah laut berdasarkan DNV OS F101

Menghitung tegangan yang terjadi pada pipa bawah laut selama proses instalasi. Tegangan yang dihitung adalah tegangan ekuivalen (Von Mises). Jika tegangan yang terjadi memenuhi kriteria yang diizinkan, maka dilanjutkan untuk perhitungan *local buckling*. Jika tidak memenuhi maka harus dilakukan pemodelan ulang.

10. Cek *local buckling* berdasarkan DNV OS F-101.

Analisis *local buckling* ini mengacu pada DNV OS F101. *Local buckling* berasal dari kombinasi kritis dari *bending moment* dan *axial force* yang kemudian dicari UC. Jika UC kurang dari 1, maka analisis dinamis instalasi pipa bawah laut dinyatakan selesai. Namun jika UC lebih dari 1, maka harus dilakukan permodelan ulang.

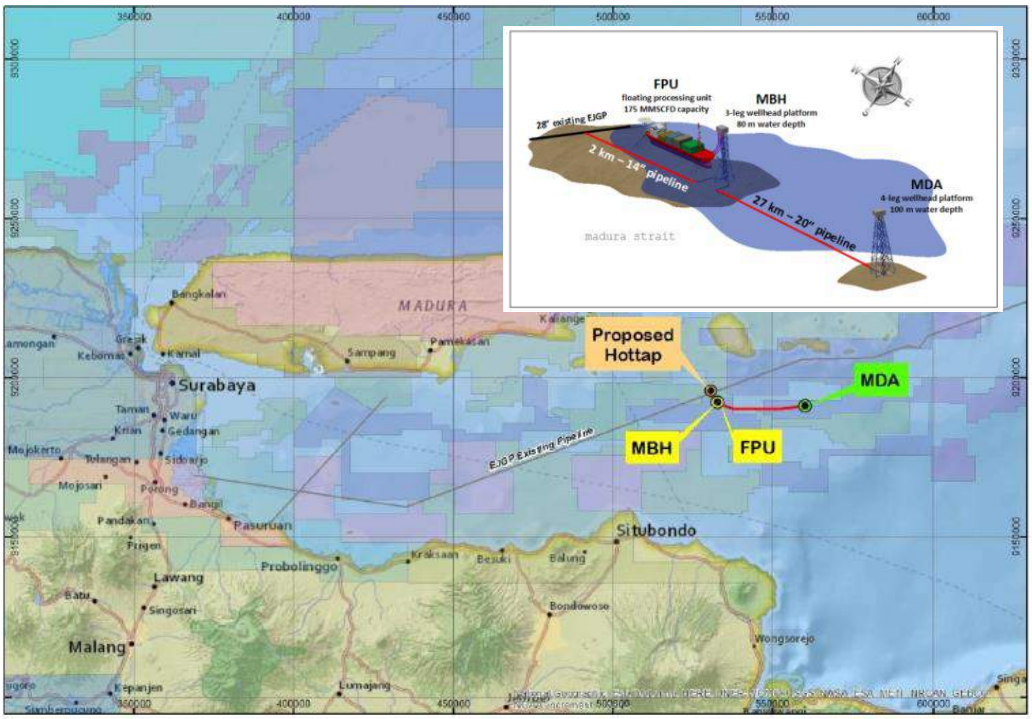
BAB IV

ANALISA DAN PEMBAHASAN

BAB IV
ANALISA DAN PEMBAHASAN

4.1 Pengumpulan Data

Data yang dipergunakan dalam studi kasus ini merupakan data pada proyek pipa 20 inch antara *MDA Wellhead Platform* dan *MBH Wellhead Paltform* sepanjang 27 km. Lokasi proyek tersebut berada di Selat Madura, Madura. Peta lokasi proyek tersebut dapat dilihat pada Gambar 4.1 di bawah ini:



Gambar 4.1 Lapangan Gas MDA dan MBH (HCML, 2016)

Instalasi *pipeline* dilakukan dengan metode instalasi s-lay. *Barge* yang digunakan adalah *DLB01 Pipelay Barge*.

Ada beberapa data yang digunakan dalam penelitian ini, diantaranya adalah data properti pipa, data properti *barge* dan *stinger*, data lingkungan kondisi setempat, dan data yang berkaitan dengan sistem perlindungan pipa (*concrete coating* dan *corrosion coating*). Data yang digunakan pada studi kasus ini dapat dilihat pada Tabel 4.1 s/d 4.7 berikut:

4.11 Data Properti Pipa

Tabel 4.1 *Pipeline Properties* (HCML, 2016)

Descriptions	Unit	20 inch MDA/MBH Pipeline
Outside Diameter	inch (mm)	20 inch (508 mm)
Wall Thickness	mm	15.9
Steel Grade	-	API 5L X65
SMYS	MPa	448
Density	kg/m3	7850
Modulus of Elasticity	MPa	207000
Poisson's Ratio	-	0.3
Average Joint Length	m	12.1

4.1.2 Data Concrete Coating dan Corrosion Coating

Tabel 4.2 Corrosion Coating Data (HCML, 2016)

Descriptions	Unit	Value
Corrosion Coating Material	-	AE
Corrosion Coating Thickness	mm	5.5
Coating Density	kg/m3	1280

Tabel 4.3 Pipeline Concrete Coating Data (HCML, 2016)

Descriptions	Unit	Value
Concrete Coating Thickness	mm	40
Density	kg/m3	3044
Max. Water Absorption	%	5

4.1.3 Data *Barge*

Tabel 4.4 *DLB01 Barge Data* (HCML, 2016)

Descriptions	Barge Parameters		
Pipe Tension Machine Available	1 x 45 MT and 1 x 68 MT		
No. Of Tensioners Available on the Barge	2		
No. Of Rollers on the Barge	7		
Hitch X-Location	- 1.884 m		
Hitch Y-Location	- 4.495 m		
Hitch to stinger	10.11 deg		
Barge Moulded Dimensions	Length	Breadth	Depth
	121.9 m	32.3m	8.7 m
Draft AFT (During Laying)	5.73 m		
Draft MEAN (During Laying)	5.20 m		
Draft FWD (During Laying)	4.67 m		
Barge Trim (During Laying)	0.5 deg		
Roller Stinger Capacity	300 kN		

Tabel 4.5 Configuration of Rollers on the Barge (HCML, 2016)

Rollers/Tensioners	X Coordinate	Y Coordinate
R1	96.37	2.489
R2	84.33	2.27
R3	73.5	2.05
T1	60.15	1.745
R4	46.49	1.43
T2	35.4	1.04
R5	23.38	0.26
R6	8.91	-1.42
R7	3.12	-2.372

4.1.4 Data Stinger

Tabel 4.6 Configuration of Rollers on the Stinger (HCML, 2016)

Rollers/Tensioners	X Coordinate	Y Coordinate
S1	5.593	1.261
S2	14.737	1.261
S3	24.707	1.223
S4	33.851	1.223
S5	43.707	1.223
S6	52.851	1.223
S7	62.592	1.246
S8	73.4	1.246
S9	76.518	0.638

4.1.5 Data Lingkungan

Tabel 4.7 *Wave Data* (HCML, 2016)

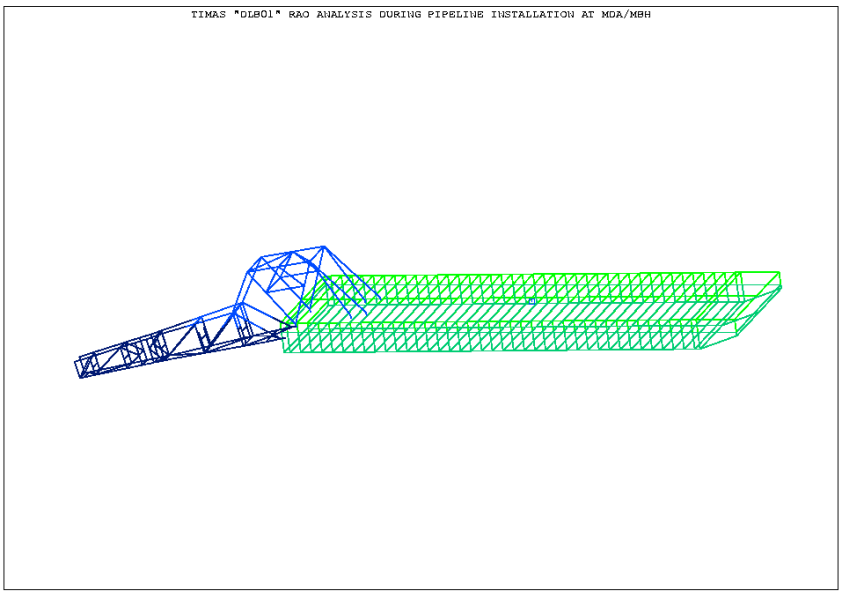
Return Period (years)	Hs (m)	Ts (s)
1	2.68	5.46
10	3.9	6.26
100	5.09	6.89

Tabel 4.8 *Current Data* (HCML, 2016)

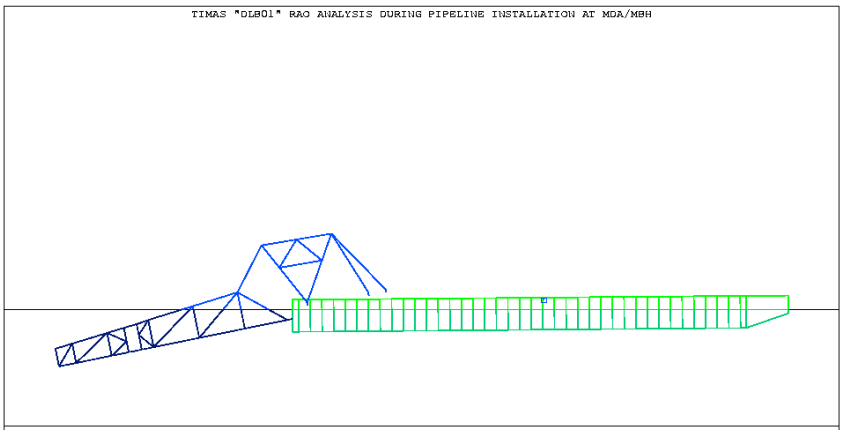
Return Period (years)	Current Speed (cm/s)
1	51.77
10	61.72
100	69.45

4.2 Permodelan *Barge*

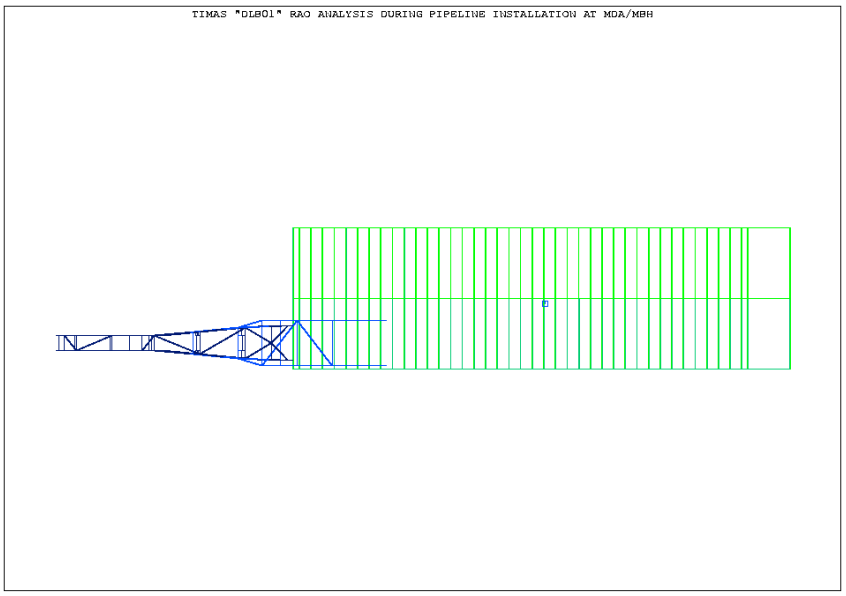
Struktur *pipelay barge* dimodelkan sesuai dengan data yang ada pada Tabel 4.4 di atas. Pemodelan *pipelay barge* dalam studi kasus ini dilakukan dengan bantuan *software* MOSES. Pembuatan model *pipelay barge* mengacu pada data *general arrangement* yang ada. Hasil permodelan yang sudah dilakukan dapat dilihat pada Gambar 4.2 s/d 4.4 berikut:



Gambar 4.2 Model *Barge* Tampak Isometri



Gambar 4.3 Model *Barge* Tampak Samping



Gambar 4.4 Model *Barge* Tampak Atas

4.3 Validasi *Barge*

Sebelum melanjutkan ke tahap selanjutnya, model *pipelay barge* yang telah dibuat dengan bantuan *software* MOSES harus dilakukan validasi terlebih dahulu, agar model yang telah dibuat bisa mewakili keadaan *pipelay barge* yang sebenarnya. Validasi dilakukan dengan membandingkan parameter hasil permodelan dari software MOSES dengan data yang ada. Kriteria validasi yang digunakan mengacu pada IACS dimana kriteria validasi untuk *displacement* bernilai 2% dan untuk parameter lain maksimal 1%. Hasil output *software* MOSES dalam perhitungan *displacement barge* dilampirkan dalam Lampiran A dan validasi yang telah dilakukan, dapat dilihat pada Tabel 4.9 berikut ini:

Tabel 4.9 Validasi Model *Pipelay Barge*

Parameter	Model	Data	Error (%)
Loa (m)	121.9	121.9	0
Breadth (m)	32.3	32.3	0
Depth (m)	8.68	8.68	0
Draft (m)	4.7	4.7	0
Displacement (ton)	18449.92	18438.69	0.061
GMT (m)	12.88	12.87	0.078
GML (m)	250.19	249.47	0.288

Berdasarkan hasil validasi pada Tabel 4.9, maka dapat disimpulkan bahwa model *barge* yang telah dibuat dengan bantuan *software* MOSES dinyatakan valid dan bisa digunakan untuk analisis pada tahapan selanjutnya.

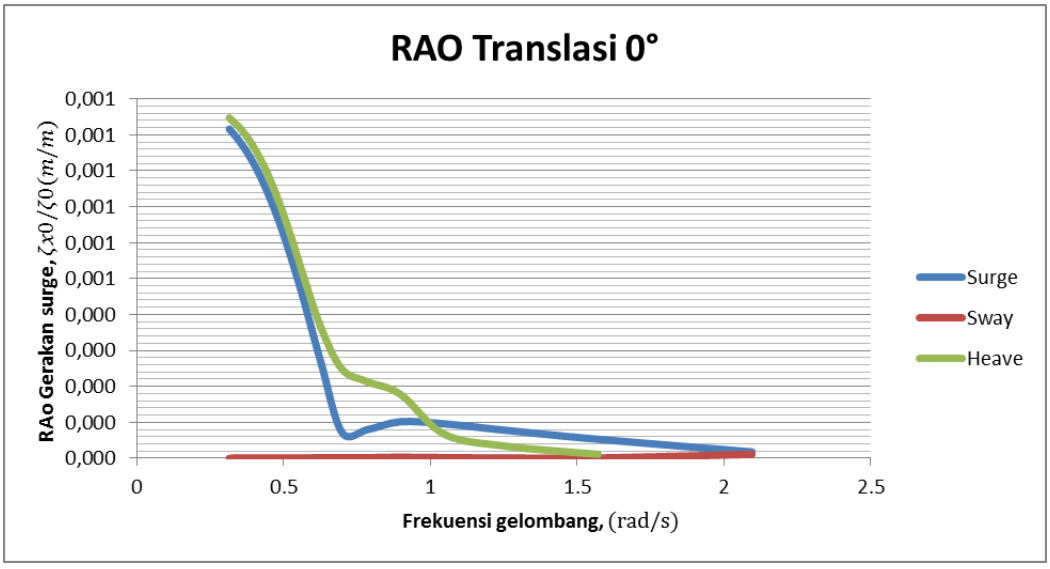
4.4 Analisis Karakteristik Gerak *Barge* pada Gelombang Acak

Setelah melakukan validasi struktur pada tahapan sebelumnya, kemudian dilanjutkan unutk analisis karakteristik gerak *pipe lay barge* pada gelombang acak atau yang lebih dikenal dengan analisis *Response Amplitude Operator* (RAO).

Dalam penelitian ini, RAO *barge* dihasilkan dengan bantuan *software* MOSES. Untuk memperoleh RAO pada *software* tersebut, harus terlebih dahulu melakukan input data *center of gravity* pada sumbu x, y, dan z serta input data jari-jari girasi (k_{xx}, k_{yy}, k_{zz}) *barge*. Input data *center of gravity* dan jari-jari girasi dilakukan sesuai dengan nilai yang ada pada *stability booklet barge*.

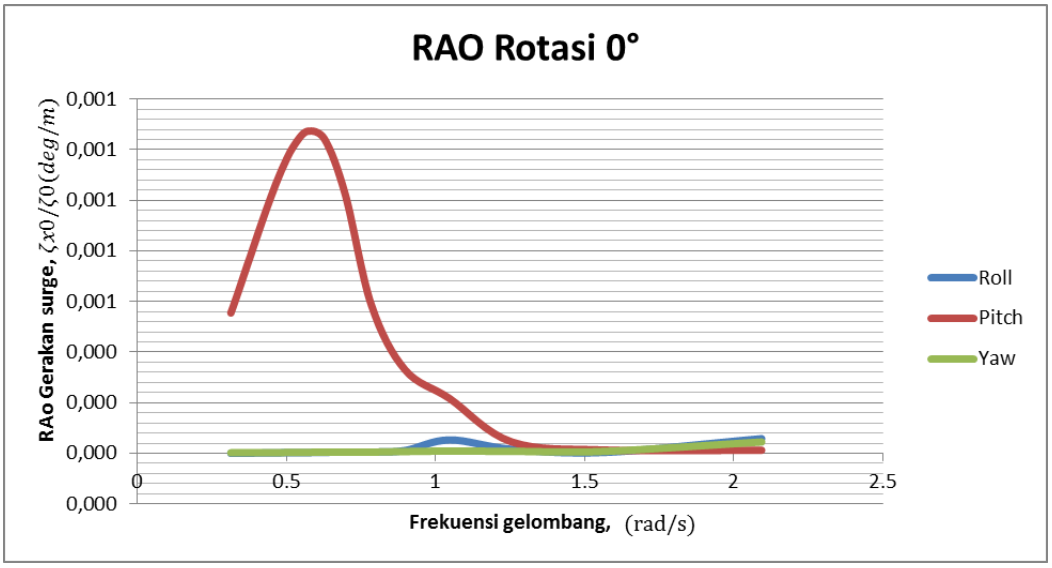
Nilai *center of gravity* yang dimasukkan pada *software* MOSES untuk perhitungan RAO pada sumbu x, y, dan z beturut-turut adalah 66.6 m, 0 m, dan 8.48 m. sedangkan nilai jari-jari girasi pada sumbu x, y, dan z berturut-turut adalah 7.77 m, 32.39 m, dan 32.49 m.

Dalam melakukan analisis RAO, *barge* akan dianalisis gerakannya terhadap kondisi *free floating* dengan kondisi lingkungan sesuai data. Output yang dihasilkan berupa grafik RAO (*Response Amplitude Operator*) dengan arah pembebanan 0°, 45°, 90°, 135°, dan 180° dalam gerak *surge*, *heave*, *sway*, *roll*, *pitch*, dan *yaw*. Hasil output *software* MOSES dalam perhitungan RAO dilampirkan pada Lampiran B.



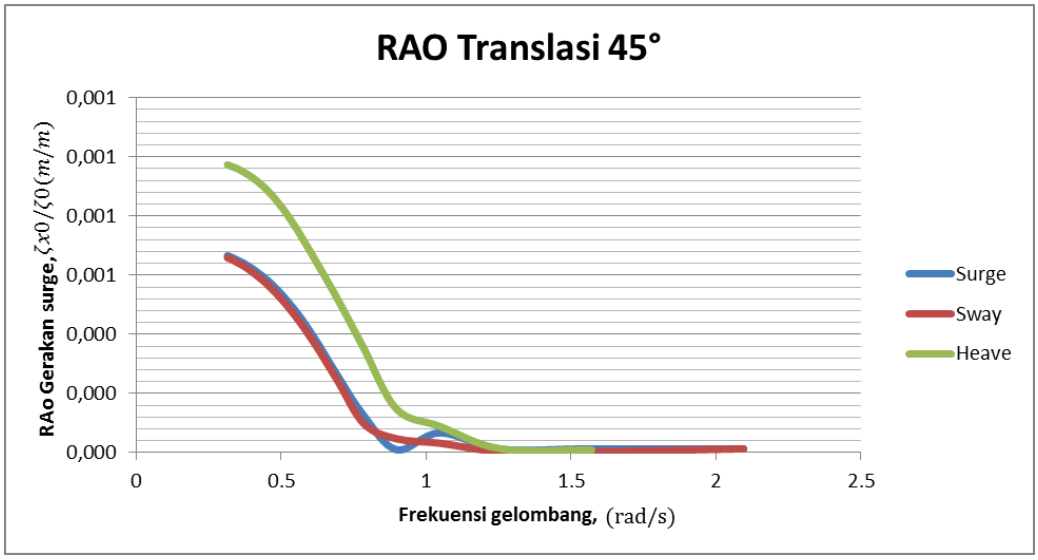
Gambar 4.5 Grafik RAO Translasi 0°

Berdasarkan Gambar 4.5 dapat diketahui bahwa nilai respon signifikan pada gerakan translasional arah pembebanan 0° terjadi pada gerak *heave* ketika frekuensi 0.3142 rad/s dengan nilai sebesar 0.947 m/m dan pada gerak *surge* dengan frekuensi yang sama dengan nilai 0.916 m/m.



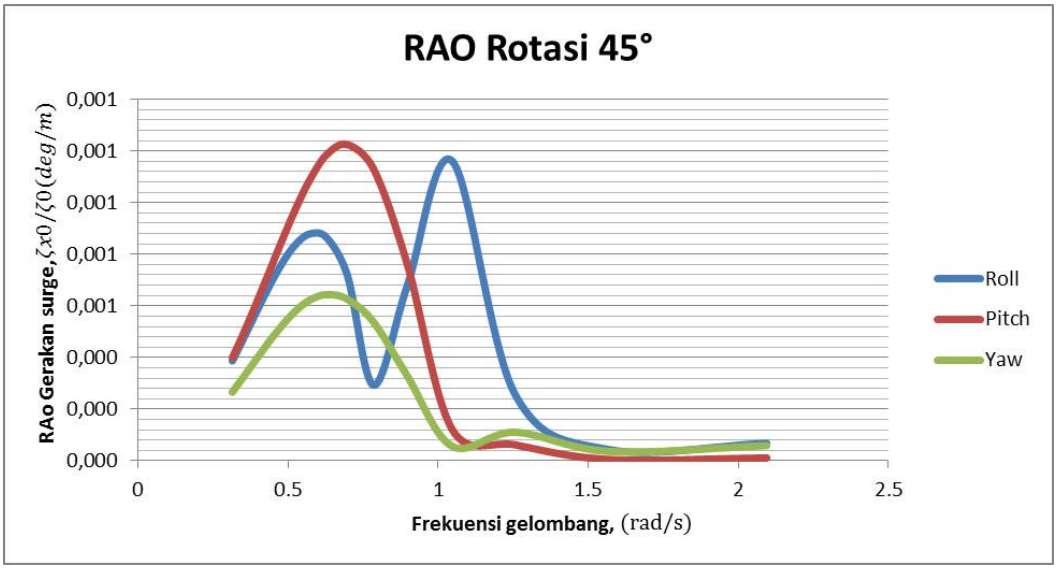
Gambar 4.6 Grafik RAO Rotasi 0°

Sementara untuk berdasarkan Gambar 4.6 dapat diketahui bahwa nilai respon yang paling signifikan pada gerakan rotasi arah pembebanan 0° terjadi pada gerak *pitch* ketika frekuensi 0.5712 rad/s dengan nilai sebesar 1.273 deg/m. Kemudian respon terus menerus menurun seiring dengan bertambahnya frekuensi.



Gambar 4.7 Grafik RAO Translasi 45°

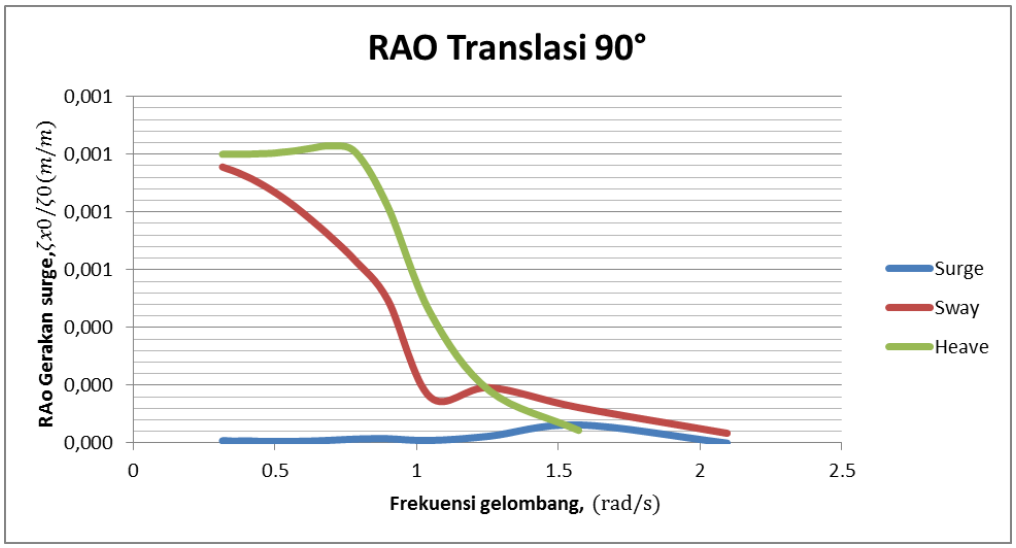
Pada Gambar 4.7 dapat diketahui bahwa nilai respon signifikan pada gerakan translasional arah pembebanan 45° terjadi pada gerak *heave* ketika frekuensi 0.3142 rad/s dengan nilai 0.973 m/m kemudian gerak *surge* yang bernilai 0.666 m/m dan *sway* yang bernilai 0.659 m/m dengan frekuensi yang sama.



Gambar 4.8 Grafik RAO Rotasi 45°

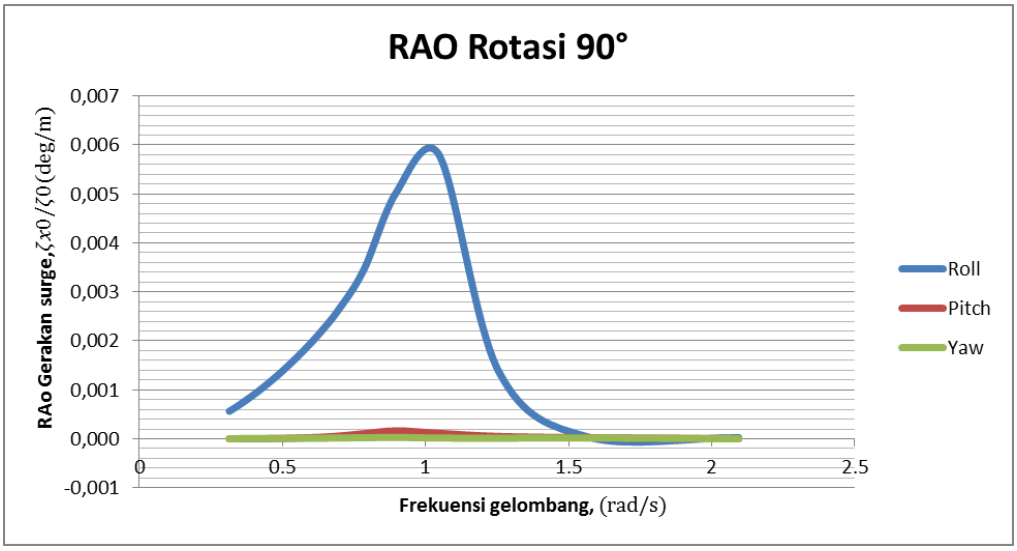
Sementara dapat diketahui dari Gambar 4.8 bahwa nilai respon signifikan pada gerakan rotasi arah pembebanan 45° adalah gerak *pitch* ketika frekuensi 0.6981 rad/s dengan nilai sebesar 1.225 deg/m, gerak *roll* ketika frekuensi 1.0472

rad/s dengan nilai sebesar 1.161 deg/m, dan gerak *yaw* ketika frekuensi 0.6283 rad/s dengan nilai sebesar 0.644 deg/m.



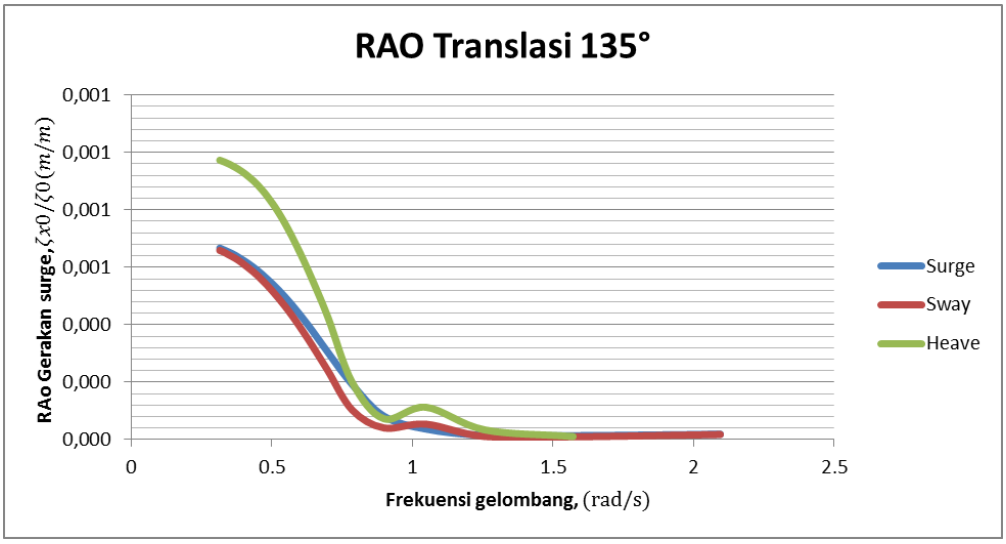
Gambar 4.9 Grafik RAO Translasi 90°

Pada Gambar 4.9 dapat diketahui bahwa nilai respon signifikan pada gerakan translasional arah pembebanan 90° adalah gerak *heave* ketika frekuensi 0.6981 rad/s dengan nilai sebesar 1.029 m/m, pada gerak *sway* ketika frekuensi 0.3142 rad/s dengan nilai sebesar 0.956 m/m.



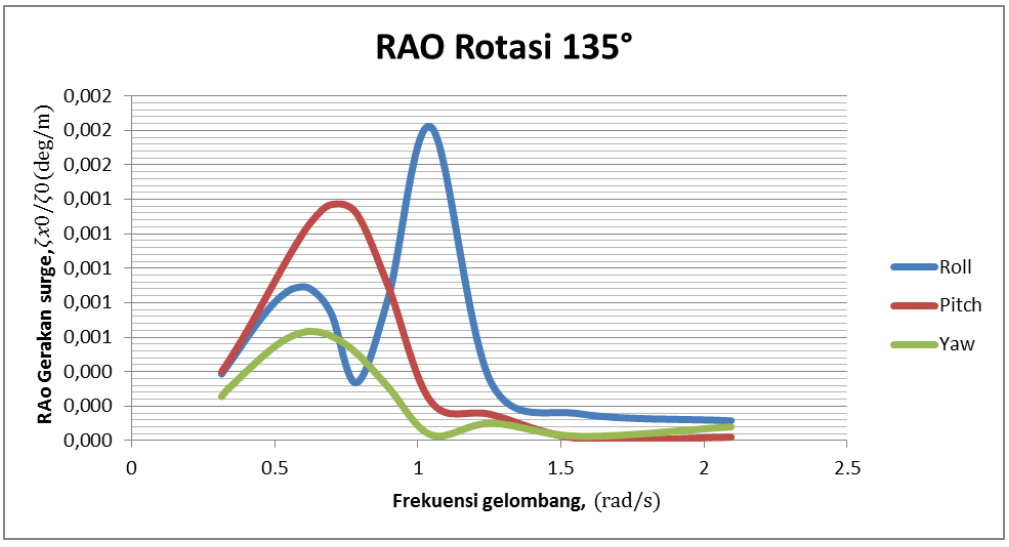
Gambar 4.10 Grafik RAO Rotasi 90°

Sementara dapat diketahu dari Gambar 4.10 bahwa nilai respon yang paling signifikan pada gerakan rotasi arah pembebanan 90° adalah gerak *roll* ketika frekuensi 1.0472 rad/s dengan nilai sebesar 5.798 deg/m.



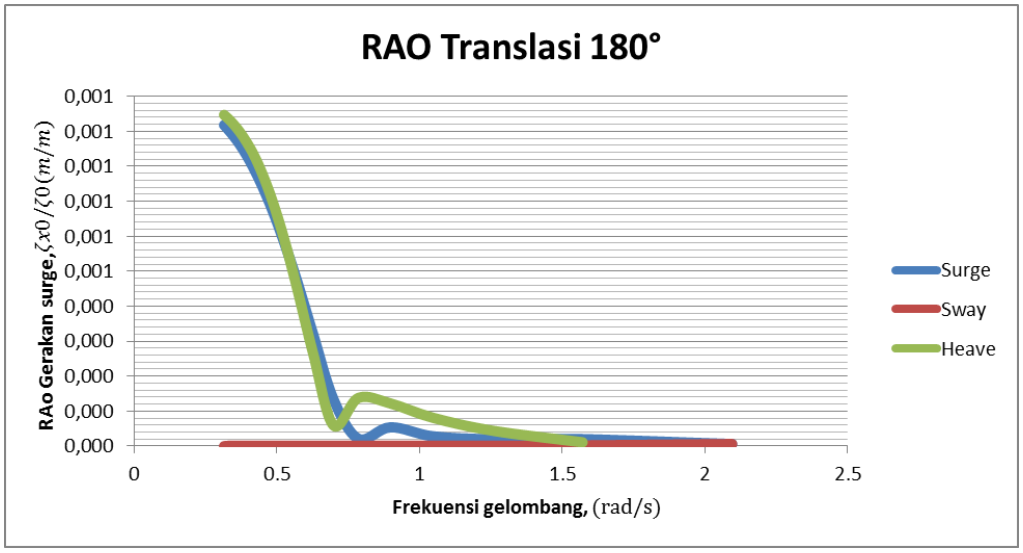
Gambar 4.11 Grafik RAO Translasi 135°

Pada Gambar 4.11 dapat diketahui bahwa nilai respon signifikan pada gerakan translasional arah pembebanan 135° adalah gerak *heave* ketika frekuensi 0.3142 rad/s dengan nilai sebesar 0.973 m/m, gerak *surge* dengan nilai sebesar 0.667 m/m, dan gerak *sway* dengan nilai sebesar 0.659 m/m dengan frekuensi yang sama.



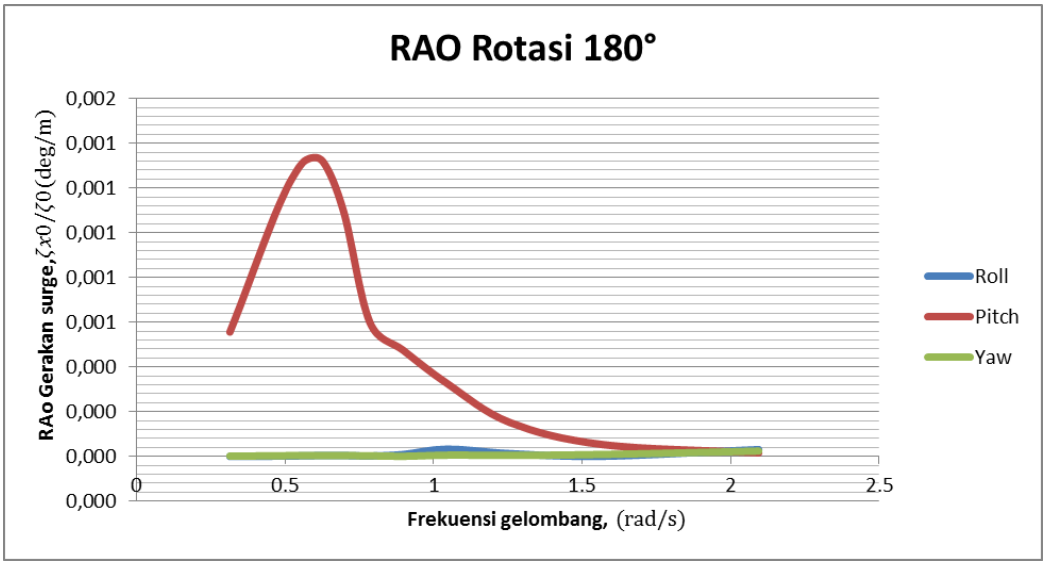
Gambar 4.12 Grafik RAO Rotasi 135°

Sedangkan pada Gambar 4.12 dapat diketahui bahwa nilai respon signifikan pada gerakan rotasi dengan arah pembebanan 135° adalahgerak *roll* ketika frekuensi 1.0472 rad/s dengan nilai sebesar 1.819 deg/m, gerak *pitch* ketika frekuensi 0.6981 rad/m, dan gerak *yaw* ketika frekuensi 0.6283 rad/s dengan nilai sebesar 0.634 deg/m.



Gambar 4.13 Grafik RAO Translasi 180°

Pada Gambar 4.13 dapat diketahui bahwa nilai respon signifikan pada gerakan translasional arah pembebanan 180° adalah gerak *heave* ketika frekuensi 0.3142 rad/s dengan nilai sebesar 0.947 m/m dan gerak *surge* dengan nilai sebesar 0.918 m/m dengan frekuensi yang sama.



Gambar 4.14 Grafik RAO Rotasi 180°

Sementara dapat diketahu dari Gambar 4.14 bahwa nilai respon yang paling signifikan pada gerakan rotasi arah pembebanan 180° adalah gerak *pitch* ketika frekuensi 0.5712 rad/s dengan nilai sebesar 1.326 deg/m.

4.5 Perhitungan Koefisien dan Eksponen Spektrum JONSWAP

Untuk mengerjakan analisis dinamis dalam software OFFPIPE telah diberikan satu rumusan generik spektra secara umum yaitu:

$$S = \frac{\mathrm{B}}{\omega^5} \times \exp\left(\frac{-\mathrm{C}}{\omega^4}\right) \tag{4.1}$$

Dimana B dan C adalah koefisien dan eksponen spektra gelombang. Dari koefisien B dan C ini dapat ditentukan tipe spektra yang ingin digunakan dalam analisis. Dalam analisis ini spektra yang digunakan adalah spektra JONSWAP dimana rumus dari spektra JONSWAP adalah sebagai berikut:

$$\mathrm{S}_{(\omega)} = \alpha . g^2 \omega^2 \exp[-1{,}25\ (\omega/\omega_0)^{-4}] \gamma^{\exp\left[\frac{(\omega-\omega_0)^2}{2\tau^2 {\omega_0}^2}\right]} \tag{4.2}$$

Jika mengacu pada Persamaan 4.1 yang digunakan OFFPIPE maka dapat kita simpulkan bahwa *1st JONSWAP coefficient* adalah α dan *2nd JONSWAP coefficient* adalah γ dimana berdasarkan DNV RP F-109 konstanta *Generalized Phillips* adalah:

(4.3)

$$\alpha = \frac{5}{16} \times \frac{{H_s}^2 {\omega_p}^4}{g^2} \times (1 - 0{,}287 \ln \gamma)$$

Sementara γ atau *peak wave enhancement* mengikuti peraturan dari DNV RP C-205 dimana:

$$\gamma = \begin{cases} 5{,}0 & \varphi < 3{,}6 \\ \exp(5{,}75 - 1{,}15)\,\varphi & 3{,}6 < \varphi < 5{,}0;\ \varphi = \dfrac{T_p}{\sqrt{H_s}} \\ 1{,}0 & \varphi \geq 5{,}0 \end{cases} \tag{4.4}$$

Sehingga didapatkan nilai γ dan α dimana nilai ini akan digunakan dalam input *software* OFFPIPE seperti pada Tabel 4.10 berikut:

Tabel 4.10 Nilai γ dan α sebagai Input JONSWAP dalam *Software* OFFPIPE

Water Depth (m)	**Hs** (m)	**Tp** (s)	**Wave Direction** (Deg)	$\varphi = \frac{T_p}{\sqrt{H_s}}$	$\omega_p = \frac{2\pi}{T_p}$	**The Peak Enhancement Parameter**, γ	**The Phillips' Constant, α**
109	1.2	4.69	0	4.281	1.34	2.285	0.01149
	1.2	4.69	45	4.281	1.34	2.285	0.01149
	1.1	4.49	90	4.281	1.40	2.286	0.01149
	1	4.29	135	4.290	1.46	2.263	0.01144
	1.3	4.89	180	4.289	1.28	2.266	0.01145
101	1.3	4.89	0	4.289	1.28	2.266	0.01145
	1.3	4.89	45	4.289	1.28	2.266	0.01145
	1.2	4.69	90	4.281	1.34	2.285	0.01149
	1.2	4.69	135	4.281	1.34	2.285	0.01149
	1.3	4.89	180	4.289	1.28	2.266	0.01145
91	1.3	4.89	0	4.289	1.28	2.266	0.01145
	1.3	4.89	45	4.289	1.28	2.266	0.01145
	1.3	4.89	90	4.289	1.28	2.266	0.01145
	1.3	4.89	135	4.289	1.28	2.266	0.01145
	1.3	4.89	180	4.289	1.28	2.266	0.01145
80	1.3	4.89	0	4.289	1.28	2.266	0.01145
	1.3	4.89	45	4.289	1.28	2.266	0.01145
	1.3	4.89	90	4.289	1.28	2.266	0.01145
	1.3	4.89	135	4.289	1.28	2.266	0.01145
	1.3	4.89	180	4.289	1.28	2.266	0.01145

4.6 Permodelan Instalasi Pipa Bawah Laut

Dalam tugas akhir ini, permodelan proses instalasi pipa bawah laut akan dibantu dengan *software* OFFPIPE. Parameter yang diperlukan dalam analisa akan dimasukkan ke dalam OFFPIPE agar didapatkan besar tegangan yang terjadi pada saat proses instalasi berlangsung. OFFPIPE akan memodelkan secara lengkap konfigurasi *roller, tensioner, stinger* dan pipa sesuai dengan data yang dimiliki.

Permodelan *barge* pada *software* OFFPIPE dimodelkan sebagai *rigid body*, *node* digunakan utnuk mendefinisikan koordinat dari *pipe support*, *tensioner*, dan *stinger hitch* pada *barge*. *Stinger* yang digunakan pada *barge* adalah *fixed geometry stinger* dimana kurvatur dan posisi *stinger* diasumsikan relatif tetap terhadap *barge*. *Stinger* dimodelkan sebagai *rigid extension* dari *barge* itu sendiri.

Untuk mempermudah penamaan tiap kasus makadiberikan tanda nama sesuai pembagian per kedalaman dan arah pembebanan yang dapat dilihat pada Tabel 4.11.

Tabel 4.11 Tanda Kasus

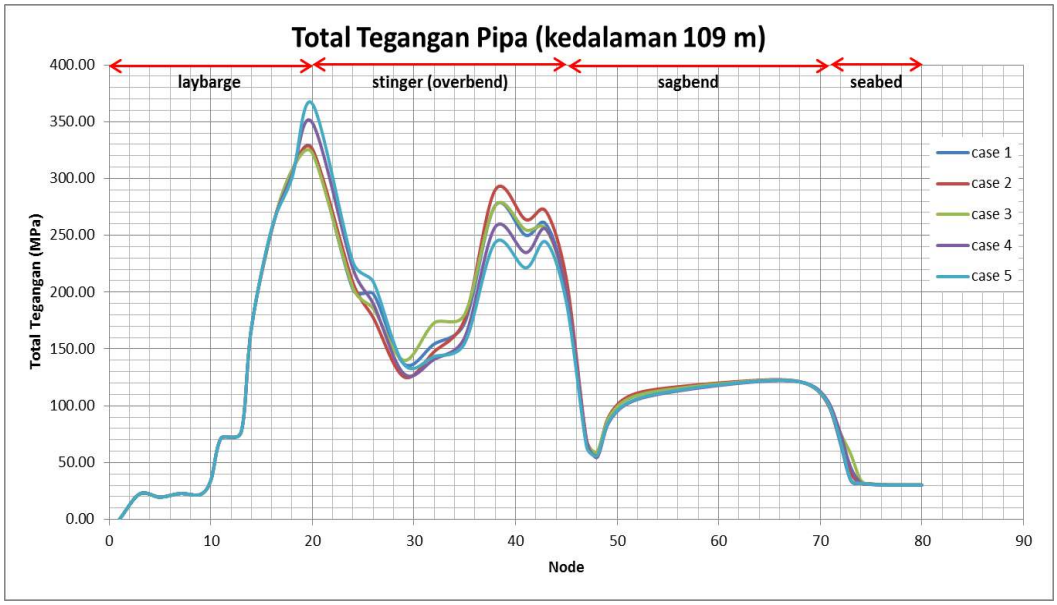
Case	Water Depth (m)	Heading (deg)
1	109	0
2		45
3		90
4		135
5		180
6	101	0
7		45
8		90
9		135
10		180
11	91	0
12		45
13		90
14		135
15		180
16	80	0
17		45
18		90
19		135
20		180

4.7 Analisis Tegangan Dinamis Pipa

Dalam analisa dinamis, diperhitungkan gerakan barge akibat beban gelombang dan pengaruhnya pada proses instalasi pipa bawah laut. Pada *software* OFFPIPE dilakukan input data pipa seperti data *pipe properties*, data *laybarge*, konfigurasi *support* pada *barge* dan *stinger*, data arus, nilai γ dan α dari spektrum JONSWAP, serta RAO (*respon amplitude operator*) yang telah didapatkan dengan bantuan *software* MOSES.

Dari analisa ini akan dihasilkan besaran maksimum *axial tension* dan *bending moment* yang nantinya akan digunakan untuk perhitugan *local buckling*.

1. Kedalaman 109 m



Gambar 4.15 Grafik Total Tegangan Pipa pada Kedalaman 109 m

Analisis dinamis pada kedalaman 109 m terbagi menjadi 80 node. *Pipe node* merupakan konfigurasi pipa mulai dari *barge* sampai ke dasar laut yang terbagi menjadi *laybarge*, *stinger*, *sagbend*, dan *seabed*. Node 1 sampai dengan node 20 merupakan *pipe node* yang berada pada *laybarge*, node 24 sampai dengan node 45 merupakan *pipe node* yang berada pada *stinger* (*overbend*), node 47 sampai dengan node 71 merupakan *pipe node* pada posisi *sagbend*, dan node 72 sampai dengan node 80 merupakan *pipe node* yang berada pada *seabed*.

Berdasarkan Gambar 4.15 di atas, total tegangan terbesar terjadi pada node ke 20 yang berada di sambungan antara *barge* dan *stinger* (*hitch*) mempunyai nilai sebesar 81.66%SMYS atau 365.84 MPa. Berdasarkan DNV OS F101, tegangan

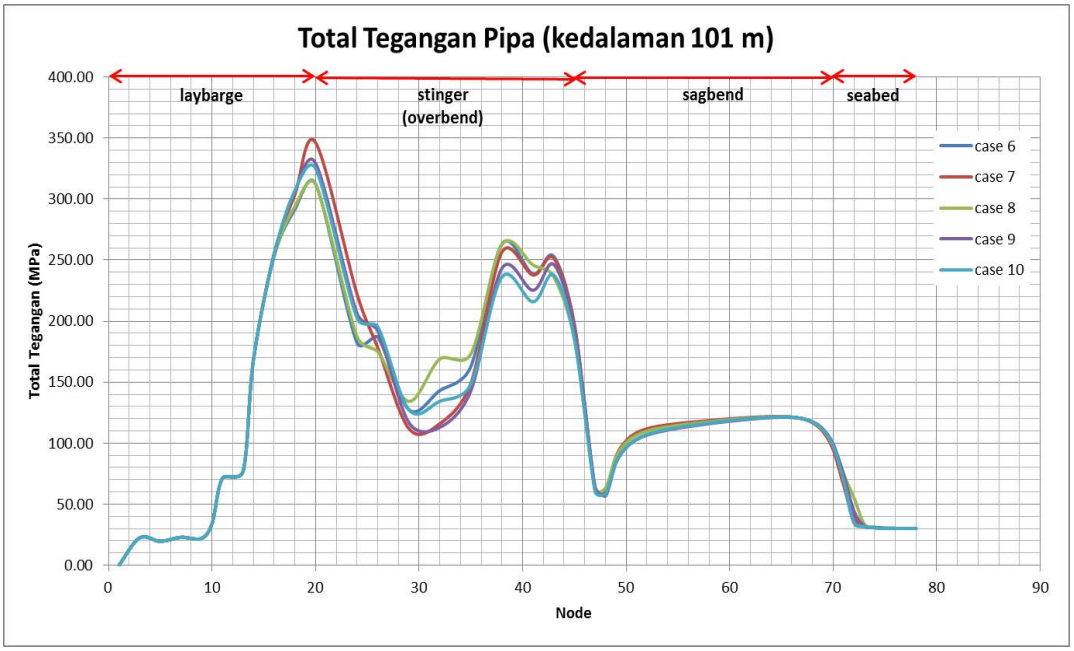
maksimal yang diizinkan adalah sebesar 87%SMYS atau 389.74 MPa. Sehingga pada kasus ini *pipeline* tidak mengalami kegagalan karena tegangan yang terjadi tidak melebihi tegangan yang diizinkan.

Besar total tegangan maksimum pipa pada kedalaman 109 m dari lima arah pembebanan dapat dilihat pada Tabel 4.12. Hasil output *software* OFFPIPE untuk perhitungan analisis dinamis (kedalaman 109 m) dilampirkan pada Lampiran C-1.

Tabel 4.12 Hasil Tegangan pada Kedalaman 109 m

WATER DEPTH	CURRENT & WAVE DIRECTION	TOTAL STRAIN AT OVERBEND (%)		MAX. STRESS AT STINGER (%SMYS)		MAX. STRESS AT SAGBEND (%SMYS)	
(M)	(DEG)	ACTUAL	ALLOW	ACTUAL	ALLOW	ACTUAL	ALLOW
109	0	0.2973	0.305	61.66	87	27.39	87
	45	0.3033		64.74		27.45	
	90	0.3030		61.64		27.40	
	135	0.2860		57.45		27.29	
	180	0.3029		54.50		27.34	

2. Kedalaman 101 m



Gambar 4.16 Grafik Total Tegangan Pipa pada Kedalaman 101 m

Analisis dinamis pada kedalaman 101 m terbagi menjadi 78 node. Node 1 sampai dengan node 20 merupakan *pipe node* yang berada pada *laybarge*, node 24 sampai dengan node 45 merupakan *pipe node* yang berada pada *stinger*

(*overbend*), node 47 sampai dengan node 71 merupakan *pipe node* pada posisi *sagbend*, dan node 72 sampai dengan node 78 merupakan *pipe node* yang berada pada *seabed*.

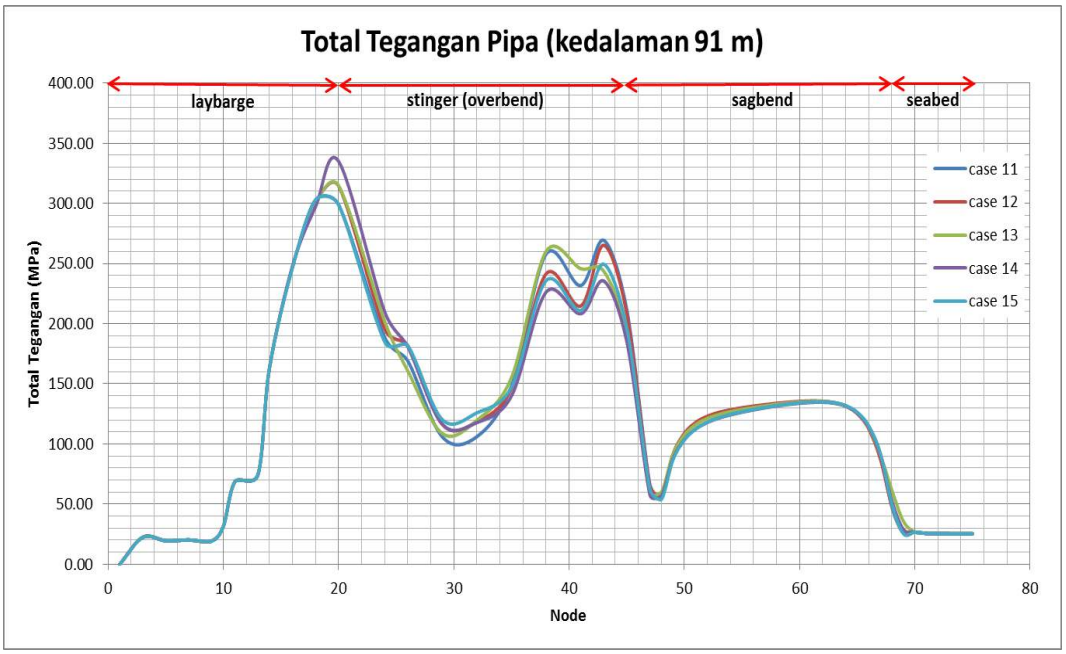
Berdasarkan Gambar 4.16 di atas, total tegangan terbesar ada pada node ke 20 yang berada di sambungan antara *barge* dan *stinger* (*hitch*) mempunyai nilai sebesar 77.30%SMYS atau 346.30 MPa. Berdasarkan DNV OS F101, tegangan maksimal yang diizinkan adalah sebesar 87%SMYS atau 389.74 MPa. Sehingga pada kasus ini *pipeline* tidak mengalami kegagalan karena tegangan yang terjadi tidak melebihi tegangan yang diizinkan.

Besar total tegangan maksimum pipa pada kedalaman 101 m dari lima arah pembebanan dapat dilihat pada Tabel 4.13. Hasil output *software* OFFPIPE untuk perhitungan analisis dinamis (kedalaman 101 m) dilampirkan pada Lampiran C-2.

Tabel 4.13 Hasil Tegangan pada Kedalaman 101 m

WATER DEPTH	CURRENT & WAVE DIRECTION	TOTAL STRAIN AT OVERBEND (%)		MAX. STRESS AT STINGER (%SMYS)		MAX. STRESS AT SAGBEND (%SMYS)	
(M)	(DEG)	ACTUAL	ALLOW	ACTUAL	ALLOW	ACTUAL	ALLOW
101	0	0.2709	0.305	58.74	87	27.15	87
	45	0.2859		57.27		27.21	
	90	0.2656		58.64		27.16	
	135	0.2929		55.02		27.06	
	180	0.2580		53.09		27.11	

3. Kedalaman 91 m



Gambar 4.17 Grafik Total Tegangan Pipa pada Kedalaman 91 m

Analisis dinamis pada kedalaman 91 m terbagi menjadi 75 node. Node 1 sampai dengan node 20 merupakan *pipe node* yang berada pada *laybarge*, node 24 sampai dengan node 45 merupakan *pipe node* yang berada pada *stinger* (*overbend*), node 47 sampai dengan node 67 merupakan *pipe node* pada posisi *sagbend*, dan node 68 sampai dengan node 75 merupakan *pipe node* yang berada pada *seabed*.

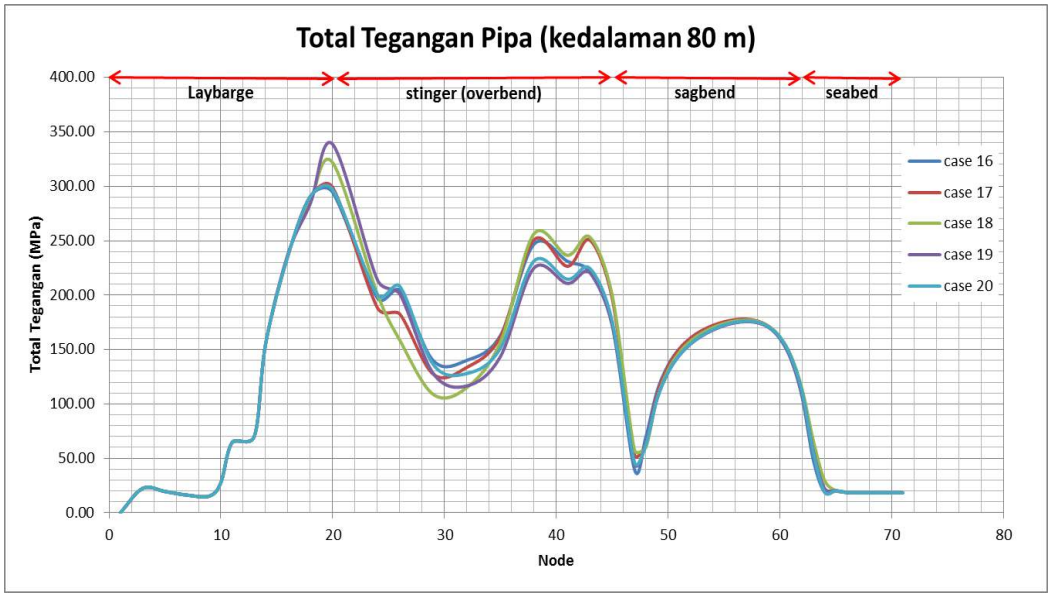
Berdasarkan Gambar 4.17 di atas, total tegangan maksimal ada pada node ke 20 yang berada di sambungan antara *barge* dan *stinger* (*hitch*) mempunyai nilai sebesar 74.75%SMYS atau 334.87 MPa. Berdasarkan DNV OS F101, tegangan maksimal yang diizinkan adalah sebesar 87%SMYS atau 389.74 MPa. Sehingga pada kasus ini *pipeline* tidak mengalami kegagalan karena tegangan yang terjadi tidak melebihi tegangan yang diizinkan.

Besar total tegangan maksimum pipa pada kedalaman 91 m dari lima arah pembebanan dapat dilihat pada Tabel 4.14. Hasil output *software* OFFPIPE untuk perhitungan analisis dinamis (kedalaman 91 m) dilampirkan pada Lampiran C-3.

Tabel 4.14 Hasil Tegangan pada Kedalaman 91 m

WATER DEPTH	CURRENT & WAVE DIRECTION	TOTAL STRAIN AT OVERBEND (%)		MAX. STRESS AT STINGER (%SMYS)		MAX. STRESS AT SAGBEND (%SMYS)	
(M)	(DEG)	ACTUAL	ALLOW	ACTUAL	ALLOW	ACTUAL	ALLOW
91	0	0.2896	0.305	60.13	87	30.20	87
	45	0.3028		59.20		30.30	
	90	0.2941		58.06		30.21	
	135	0.2792		52.57		30.07	
	180	0.2265		55.67		30.13	

4. Kedalaman 80 m



Gambar 4.18 Grafik Total Tegangan Pipa pada Kedalaman 80 m

Analisis dinamis pada kedalaman 80 m terbagi menjadi 71 node. Node 1 sampai dengan node 20 merupakan *pipe node* yang berada pada *laybarge*, node 24 sampai dengan node 45 merupakan *pipe node* yang berada pada *stinger* (*overbend*), node 47 sampai dengan node 62 merupakan *pipe node* pada posisi *sagbend*, dan node 63 sampai dengan node 75 merupakan *pipe node* yang berada pada *seabed*.

Berdasarkan Gambar 4.17 di atas, total tegangan maksimal ada pada node ke 20 yang berada di sambungan antara *barge* dan *stinger* (*hitch*) mempunyai nilai sebesar 75.58%SMYS atau 338.59 MPa. Berdasarkan DNV OS F101, tegangan maksimal yang diizinkan adalah sebesar 87%SMYS atau 389.74 MPa. Sehingga

pada kasus ini *pipeline* tidak mengalami kegagalan karena tegangan yang terjadi tidak melebihi tegangan yang diizinkan.

Besar total tegangan maksimum pipa pada kedalaman 91 m dari lima arah pembebanan dapat dilihat pada Tabel 4.15. Hasil output *software* OFFPIPE untuk perhitungan analisis dinamis (kedalaman 80 m) dilampirkan pada Lampiran C-4.

Tabel 4.15 Hasil Tegangan pada Kedalaman 80 m

WATER DEPTH	CURRENT & WAVE DIRECTION	TOTAL STRAIN AT OVERBEND (%)		MAX. STRESS AT STINGER (%SMYS)		MAX. STRESS AT SAGBEND (%SMYS)	
(M)	(DEG)	ACTUAL	ALLOW	ACTUAL	ALLOW	ACTUAL	ALLOW
80	0	0.2845	0.305	55.07	87	39.56	87
	45	0.3035		55.96		39.72	
	90	0.2919		57.19		39.52	
	135	0.2988		50.18		39.22	
	180	0.2432		51.62		39.33	

Kemudian didapatkan besar nilai maksimum *axial tension* dan *bending moment* yang dapat dilihat pada Tabel 4.16.

Tabel 4.16 Nilai Maksimum *Axial Tension* dan *Bending Moment*

WATER DEPTH	CURRENT & WAVE DIRECTION	MAX. AXIAL TENSION	MAX. BENDING MOMENT
(M)	(DEG)	(kN)	(kN-m)
109	0	767.02	845.41
	45	767.00	893.04
	90	767.05	845.23
	135	767.13	780.36
	180	756.69	736.22
101	0	767.99	800.24
	45	767.46	777.52
	90	767.86	798.60
	135	758.19	744.06
	180	758.11	714.29
91	0	630.78	840.98
	45	630.32	826.64
	90	640.20	807.66
	135	630.41	724.10
	180	630.84	772.09
80	0	443.27	789.08
	45	433.40	803.94
	90	443.55	821.77
	135	443.24	713.45
	180	443.52	735.66

4.8 Analisis *Local Buckling* Pipa Selama Proses Instalasi

Setelah melakukan analisis tegangan yang terjadi selama proses instalasi, dilakukan analisis *local buckling* atau yang biasa disebut *local buckling check*. Analisis *local buckling* dilakukan untuk mengetahui terjadinya *local buckling* pada *pipeline* yang diakibatkan oleh *bending moment* dan *axial tension* yang timbul selama proses instalasi. Nilai maksimum *bending moment* dan *axial force* didapat dari output permodelan proses instalasi *pipeline* dengan bantuan *software* OFFPIPE.

Perhitungan nilai *local buckling* dilakukan secara manual dengan menggunakan Persamaan 2.31. Berdasarkan DNV OS-F101, persamaan ini digunakan untuk menghitung *local buckling* yang terjadi karena tekanan eksternal berlebih (*external overpressure*). Nilai maksimum *bending moment* dan *axial force* yang digunakan dalam analisis *local buckling* ini dapat dilihat pada Tabel 4.16. Hasil yang didapatkan dari perhitungan *local buckling* berupa *unity check*. Dalam DNV OS-F101, *local buckling* terjadi jika nilai *unity check* melebihi satu (UC>1).

Langkah-langkah perhitungan manual *local buckling* pada kedalaman 109 m dengan gelombang datang arah 0^o adalah sebagai berikut:

diketahui:

$D = 0.508$ m (diameter luar pipa)

$t = 0.0159$ m (wall thickness)

$E = 207000$ MPa ($Modulus\ of\ Elasticity$)

$v = 0.3$ ($Poisson's\ ratio$)

$SMYS = 448$ MPa ($Specified\ Minimum\ Yield\ Strength$)

$SMTS = 530$ MPa ($Specified\ Minimum\ Tensile\ Strength$)

$\rho_w = 1025$ kg/m^3 (massa jenis air)

$wd = 109$ m (kedalaman air)

$\alpha_U = 1$ ($material\ strength\ factor$)

$\gamma_{SC} = 1.26$ ($safety\ class\ resistance\ factor$)

$\gamma_m = 1.15$ ($material\ resistance\ factor$)

$\alpha_{fab} = 0.93$ ($fabrication\ factor$)

$\gamma_c = 1.07$ ($condition\ load\ effect\ factor$)

$\gamma_F = 1.1$ ($load\ effect\ factor\ for\ functional\ load$)

$M_f = 845.41$ kNm ($bending\ moment$)

$S_f = 767.02$ kN ($axial\ force$)

dicari:

- $f_y = (SMYS - f_y, temp) \times \alpha_U$

  $f_y = (448 - 0) \times 1$

  $f_y = 448$ MPa ($yield\ stress\ to\ be\ used\ in\ design$)
- $f_u = (SMTS - f_u, temp) \times \alpha_U$

  $f_y = (530 - 0) \times 1$

  $f_u = 530$ MPa ($tensile\ strength\ to\ be\ used\ in\ designed$)
- $M_p = f_y \times (D - t)^2 \times t$

  $M_p = 448 \times 1000 \times (0.508 - 0.0159)^2 \times 0.0159$

  $M_p = 1724.97$ kNm (tahanan momen plastis)
- $S_p = f_y \times \pi \times (D - t) \times t$

  $S_p = 448 \times 1000 \times \pi \times (0.508 - 0.0159) \times 0.0159$

  $S_p = 11012.31$ kN (tahanan aksial plastis)
- $M_{Sd} = M_f \times \gamma_F \times \gamma_c$

  $M_{Sd} = 845.41 \times 1.1 \times 1.07$

  $M_{Sd} = 995.05$ kNm ($design\ moment$)
- $S_{Sd} = S_f \times \gamma_F \times \gamma_c$

  $S_{Sd} = 767.02 \times 1.1 \times 1.07$

  $S_{Sd} = 902.78$ kN ($design\ effective\ axial\ force$)
- $\beta = \frac{60 - D/t}{90}$

  $\beta = \frac{60 - 0.508/0.0159}{90}$

  $\beta = 0.3117$ ($factor\ used\ in\ combined\ loading\ criteria$)
- $\alpha_c = (1 - \beta) + \beta \frac{f_u}{f_y}$

  $\alpha_c = (1 - 0.3117) + 0.3117 \frac{530}{448}$

  $\alpha_c = 1.0570$ ($flow\ stress\ parameter$)
- $P_{el} = \frac{2 \times E \times \left(\frac{t}{D}\right)^3}{1 - v^2}$

$$P_{el} = \frac{2 \times 207000 \times \left(\frac{0.0159}{0.508}\right)^3}{1 - 0.3^2}$$

$P_{el} = 13.9495$ MPa (tekanan *collapse* elastis)

- $P_p = f_y \times \alpha_{fab} \times \frac{2t}{D}$

  $P_p = 448 \times 0.93 \times \frac{2 \times 0.0159}{0.508}$

  $P_p = 26.0810$ MPa (tekanan *collapse* plastis)

- $b = -P_{el}$

  $b = -13.9495$ MPa

- $c = -(P_p + P_p \times P_{el} \times f_o \times \frac{D}{t})$

  $c = -(26.0810 + 26.0810 \times 13.9495 \times 0.01 \times \frac{0.508}{0.0159})$

  $c = -796.4575$ MPa^2

- $d = P_{el} + {P_p}^2$

  $d = 13.9495 + 26.0810^2$

  $d = 9488.7264$ MPa^2

- $u = \frac{1}{3}\left(-\frac{1}{3}b^2 + c\right)$

  $u = \frac{1}{3}\left[-\frac{1}{3}(-13.9495)^2 - 796.4575\right]$

  $u = -287.1068$ MPa^2

- $v = \frac{1}{2}\left(\frac{2}{27}b^3 - \frac{1}{3}bc + d\right)$

  $$v = \frac{1}{2}\left[\frac{2}{27}(-13.9495)^3 - \frac{1}{3}(-13.9495 - 796.4575) + 9488.7264\right]$$

  $v = 2792.1294$ MPa^3

- $\phi = \cos^{-1}\left(\frac{-v}{\sqrt{-u^3}}\right)$

  $\phi = \cos^{-1}\left(\frac{-2792.1294}{\sqrt{287.1068^3}}\right)$

  $\phi = 2.1821$

- $y = -2\sqrt{-u}\cos\left(\frac{\phi}{3} + \frac{60\pi}{180}\right)$

$$y = -2\sqrt{287.1068}\cos\left(\frac{2.1821}{3} + \frac{60\pi}{180}\right)$$

$$y = 6.8578 \text{ MPa}$$

- $P_c = y - \frac{1}{3}b$

  $$P_c = 6.8578 - \frac{1}{3}(-13.9495)$$

  $$P_c = 1.0960 \text{ MPa}$$

- $$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c . M_p(t_2)} + \left\{\frac{\gamma_m . \gamma_{SC} . S_{Sd}(P_i)}{\alpha_c . S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{P_e - P_{\min}}{P_c(t_2)}\right)^2 \leq 1$$

  $$\left\{1.15 \times 1.26 \frac{|995.05|}{1.0570 \times 1724.97} + \left\{\frac{1.15 \times 1.26 \times 902.78}{1.0570 \times 11012.31}\right\}^2\right\}^2 + \left(1.15 \times 1.26 \frac{1.0960 - 0}{11.5077)}\right)^2 \leq 1$$

  $Local\ buckling\ check = 0.664 \leq 1$ (tidak terjadi *buckling*)

Hasil perhitungan *local buckling* pada setaip kedalaman selama proses instalasi dapat dilihat pada Tabel 4.17. Perhitungan *local buckling* dilampirkan pada Lampiran D.

Tabel 4.17 Hasil Perhitungan Local Buckling Selama Proses Instalasi Pipa Bawah Laut

WATER DEPTH	CURRENT & WAVE DIRECTION	MAX. AXIAL TENSION	MAX. BENDING MOMENT	UNITY CHECK
(M)	(DEG)	(kN)	(kN-m)	
109	0	767.02	845.41	0.664
	45	767.00	893.04	0.738
	90	767.05	845.23	0.664
	135	767.13	780.36	0.570
	180	756.69	736.22	0.510
101	0	767.99	800.24	0.596
	45	767.46	777.52	0.564
	90	767.86	798.60	0.593
	135	758.19	744.06	0.518
	180	758.11	714.29	0.479
91	0	630.78	840.98	0.646
	45	630.32	826.64	0.624
	90	640.20	807.66	0.597
	135	630.41	724.10	0.484
	180	630.84	772.09	0.547
80	0	443.27	789.08	0.561
	45	433.40	803.94	0.582
	90	443.55	821.77	0.608
	135	443.24	713.45	0.461
	180	443.52	735.66	0.490

Dari Tabel 4.17 di atas dapat diketahui bahwa pipa pada masing-masing kasus tidak mengalami *local buckling* karena UC tidak ada yang melebihi angka 1.

(Halaman ini sengaja dikosongkan)

BAB V

PENUTUP

BAB V
PENUTUP

5.1 Kesimpulan

Berdasarkan analisis dan pembahasan yang telah dilakukan pada bab sebelumnya, maka dapat ditarik beberapa kesimpulan mengenai topik dalam tugas akhir ini, yaitu:

1. Selama proses instalasi, pipa akan mengalami tegangan yang berlebih (*overstress*) tergantung pada kedalaman yang ditinjau dan arah datang arus serta gelombang menuju *barge*. Tegangan maksimum yang dialami pipa sebesar 81.66% SMYS atau 365.84 MPa yaitu pada kedalaman 109 m dengan gelombang datang arah 0^o, sehingga keseluruhan tegangan yang terjadi pada pipa tidak melebihi tegangan izin berdasarkan DNV OS F-101 (2013) yang bernilai 87% SMYS atau 389.74 MPa. Dari seluruh hasil analisis, dapat disimpulkan bahwa semakin besar kedalaman air laut dimana proses instalasi dilakukan maka semakin besar tegangan yang diterima oleh pipa.
2. Tidak terjadi *local buckling* di sepanjang 27 km *pipeline* karena *unitiy check* dari ke-20 kasus yang dianalisis tidak lebih besar dari angka 1. Pada kedalaman 109 m, UC tertinggi bernilai 0.738 dimana *axial tension*-nya bernilai sebesar 767.00 kN dan *bending moment*-nya bernilai sebesar 893.04 kN-m. Pada kedalaman 101 m, UC tertinggi bernilai 0.596. Pada kedalaman 91 m, UC tertinggi bernilai 0.646 dan pada kedalaman 80 m, UC tertinggi bernilai 0.608.

5.2 Saran

1. Perlu ditambahkan *mooring analysis* selama proses peletakan pipa.
2. Analisis dapat dilanjutkan dengan perhitungan *fatigue* dan *concrete crushing strength check.*

(Halaman ini sengaja dikosongkan)

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DAFTAR PUSTAKA

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LAMPIRAN A

HASIL *OUTPUT SOFTWARE* MOSES

(*DISPLACEMENT*)

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*****************************************************************************************************
*                                      ***  MOSES   ***                                              *
*                                      ----------------                        3 April, 2017        *
*          RESPONSE AMPLITUDE OPERATOR DLB01 BARGE OF PT. TIMAS                                      *
*          FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI                                *
*                                                                                                    *
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+++ H Y D R O S T A T I C   P R O P E R T I E S +++

For Body DLB01

Process is DEFAULT: Units Are Degrees, Meters, and M-Tons Unless Specified

Condition			Displac-	Center Of Buoyancy			W.P.	C. Flotation		Metacentric Heights			
Draft	Trim	Roll	M-Tons	---X---	---Y---	---Z---	Area	---X---	---Y---	-KMT-	-KML-	-BMT-	-BML-
0.00	0.50	0.00	1430.03	82.71	0.00	0.37	2515.276	69.77	-0.00	82.60	1744.24	82.22	1743.86
0.10	0.50	0.00	1691.87	80.66	0.00	0.42	2595.153	69.24	0.00	75.24	1551.09	74.82	1550.67
0.20	0.50	0.00	1961.92	79.05	0.00	0.46	2675.243	68.74	0.00	69.79	1404.84	69.32	1404.38
0.30	0.50	0.00	2239.47	77.75	0.00	0.51	2741.786	68.53	0.00	65.43	1269.77	64.92	1269.26
0.40	0.50	0.00	2523.84	76.70	-0.00	0.56	2808.530	68.33	0.00	62.04	1161.66	61.48	1161.10
0.50	0.50	0.00	2815.07	75.82	0.00	0.61	2875.478	68.14	0.00	59.36	1073.13	58.75	1072.52
0.60	0.50	0.00	3113.17	75.07	-0.00	0.66	2942.626	67.95	-0.00	57.22	999.26	56.55	998.60
0.70	0.50	0.00	3418.16	74.43	-0.00	0.71	3009.977	67.76	-0.00	55.47	936.66	54.76	935.94
0.80	0.50	0.00	3730.06	73.86	0.00	0.77	3077.530	67.58	-0.00	54.05	882.90	53.28	882.14
0.90	0.50	0.00	4048.89	73.35	0.00	0.82	3145.285	67.40	0.00	52.88	836.23	52.06	835.41
1.00	0.50	0.00	4374.68	72.90	-0.00	0.87	3213.240	67.22	0.00	51.92	795.31	51.05	794.43
1.10	0.50	0.00	4707.44	72.49	-0.00	0.93	3281.400	67.05	-0.00	51.13	759.12	50.20	758.19
1.20	0.50	0.00	5047.19	72.12	0.00	0.98	3349.157	66.89	-0.00	50.48	726.46	49.50	725.48
1.30	0.50	0.00	5393.71	71.77	0.00	1.04	3413.140	66.75	0.00	49.85	694.82	48.82	693.79
1.40	0.50	0.00	5746.50	71.46	-0.00	1.09	3471.296	66.53	-0.00	49.06	664.15	47.97	663.06
1.50	0.50	0.00	6104.93	71.16	-0.00	1.15	3523.353	66.26	-0.00	48.13	635.18	46.98	634.04
1.60	0.50	0.00	6468.39	70.87	-0.00	1.20	3569.311	65.95	-0.00	47.07	608.36	45.87	607.16
1.70	0.50	0.00	6836.24	70.60	0.00	1.26	3609.168	65.63	-0.00	45.90	583.80	44.64	582.55
1.80	0.50	0.00	7207.86	70.33	0.00	1.31	3642.928	65.31	0.00	44.64	561.36	43.33	560.05
1.90	0.50	0.00	7582.63	70.07	-0.00	1.37	3670.589	65.00	-0.00	43.31	540.73	41.94	539.37
2.00	0.50	0.00	7959.93	69.83	-0.00	1.42	3692.153	64.73	-0.00	41.91	521.45	40.48	520.03
2.10	0.50	0.00	8339.12	69.59	-0.00	1.47	3707.698	64.52	0.00	40.44	502.99	38.97	501.52
2.20	0.50	0.00	8719.62	69.36	0.00	1.53	3718.031	64.36	-0.00	38.95	484.95	37.42	483.42

2.30	0.50	0.00	9101.10	69.15	0.00	1.58	3727.180	64.22	0.00	37.56	468.05	35.98	466.47
2.40	0.50	0.00	9483.42	68.95	0.00	1.64	3734.657	64.11	-0.00	36.26	451.91	34.62	450.27
2.50	0.50	0.00	9866.48	68.75	-0.00	1.69	3741.652	64.00	-0.00	35.05	436.85	33.36	435.16
2.60	0.50	0.00	10250.25	68.57	-0.00	1.74	3748.420	63.90	0.00	33.93	422.84	32.19	421.10
2.70	0.50	0.00	10634.70	68.40	0.00	1.80	3755.074	63.80	0.00	32.89	409.80	31.10	408.00
2.80	0.50	0.00	11019.83	68.24	-0.00	1.85	3761.615	63.70	0.00	31.92	397.61	30.08	395.77
2.90	0.50	0.00	11405.63	68.08	-0.00	1.90	3768.042	63.60	-0.00	31.02	386.21	29.12	384.31
3.00	0.50	0.00	11792.07	67.93	-0.00	1.95	3774.356	63.51	-0.00	30.18	375.51	28.22	373.56
3.10	0.50	0.00	12179.17	67.79	-0.00	2.01	3780.555	63.41	-0.00	29.39	365.45	27.38	363.45
3.20	0.50	0.00	12566.88	67.65	-0.00	2.06	3786.641	63.32	-0.00	28.65	355.98	26.59	353.92
3.30	0.50	0.00	12955.22	67.52	-0.00	2.11	3792.614	63.23	-0.00	27.95	347.03	25.84	344.92
3.40	0.50	0.00	13344.17	67.39	-0.00	2.16	3798.472	63.14	-0.00	27.29	338.57	25.13	336.41
3.50	0.50	0.00	13733.70	67.27	-0.00	2.21	3804.224	63.05	-0.00	26.67	330.56	24.46	328.35
3.60	0.50	0.00	14123.82	67.15	0.00	2.27	3809.927	62.96	-0.00	26.09	322.97	23.82	320.71
3.70	0.50	0.00	14514.53	67.03	-0.00	2.32	3815.595	62.87	-0.00	25.54	315.78	23.22	313.46
3.80	0.50	0.00	14905.81	66.92	-0.00	2.37	3821.229	62.79	-0.00	25.02	308.95	22.65	306.58
3.90	0.50	0.00	15297.68	66.81	-0.00	2.42	3826.827	62.70	-0.00	24.52	302.46	22.10	300.04
4.00	0.50	0.00	15690.07	66.71	-0.00	2.47	3831.602	62.63	-0.00	24.05	296.09	21.58	293.62
4.10	0.50	0.00	16082.95	66.61	-0.00	2.53	3836.247	62.56	-0.00	23.61	290.01	21.08	287.48
4.20	0.50	0.00	16476.29	66.51	0.00	2.58	3840.835	62.49	-0.00	23.19	284.20	20.61	281.62
4.30	0.50	0.00	16870.11	66.41	-0.00	2.63	3845.366	62.42	-0.00	22.79	278.64	20.16	276.01
4.40	0.50	0.00	17264.38	66.32	0.00	2.68	3849.840	62.35	-0.00	22.40	273.33	19.72	270.65
4.50	0.50	0.00	17659.12	66.23	-0.00	2.73	3854.256	62.28	-0.00	22.04	268.24	19.31	265.50
4.60	0.50	0.00	18054.29	66.14	-0.00	2.78	3858.617	62.21	-0.00	21.69	263.35	18.91	260.57
4.70	0.50	0.00	18449.92	66.05	0.00	2.84	3862.946	62.15	-0.00	21.36	258.67	18.52	255.84

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****************************************************************************************************
*                                          ***  MOSES   ***                                        *
*                                          ----------------                    3 April, 2017       *
*         RESPONSE AMPLITUDE OPERATOR DLB01 BARGE OF PT. TIMAS                                     *
*         FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI                               *
*                                                                                                  *
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+++ H Y D R O S T A T I C   C O E F F I C I E N T S +++

For Body DLB01

Process is DEFAULT: Units Are Degrees, Meters, and M-Tons Unless Specified

/--- Condition ---/ Draft	Trim	Roll	Displacement	Wetted Surface	Load To Change Draft 1 MM	/--- For KG = KB ----/ Moment To Change .01 Deg --- Heel ---	--- Trim ---
0.00	0.50	0.00	1430.03	2548.8	2.58	20.52	435.25
0.10	0.50	0.00	1691.87	2635.0	2.66	22.09	457.89
0.20	0.50	0.00	1961.92	2721.5	2.74	23.74	480.89
0.30	0.50	0.00	2239.47	2794.7	2.81	25.37	496.10
0.40	0.50	0.00	2523.84	2868.2	2.88	27.08	511.46
0.50	0.50	0.00	2815.07	2941.9	2.95	28.87	526.95
0.60	0.50	0.00	3113.17	3015.9	3.02	30.73	542.59
0.70	0.50	0.00	3418.16	3090.2	3.08	32.67	558.37
0.80	0.50	0.00	3730.06	3164.8	3.15	34.69	574.29
0.90	0.50	0.00	4048.89	3239.7	3.22	36.79	590.36
1.00	0.50	0.00	4374.68	3314.8	3.29	38.98	606.57
1.10	0.50	0.00	4707.44	3390.2	3.36	41.25	622.93
1.20	0.50	0.00	5047.19	3465.3	3.43	43.60	639.08
1.30	0.50	0.00	5393.71	3537.3	3.50	45.96	653.12
1.40	0.50	0.00	5746.50	3605.3	3.56	48.12	665.02
1.50	0.50	0.00	6104.93	3669.3	3.61	50.06	675.57
1.60	0.50	0.00	6468.39	3729.1	3.66	51.78	685.46
1.70	0.50	0.00	6836.24	3784.7	3.70	53.27	695.07

1.80	0.50	0.00	7207.86	3836.3	3.73	54.51	704.55
1.90	0.50	0.00	7582.63	3883.7	3.76	55.51	713.81
2.00	0.50	0.00	7959.93	3927.0	3.78	56.24	722.47
2.10	0.50	0.00	8339.12	3966.2	3.80	56.72	729.94
2.20	0.50	0.00	8719.62	4001.8	3.81	56.95	735.70
2.30	0.50	0.00	9101.10	4036.6	3.82	57.14	740.96
2.40	0.50	0.00	9483.42	4070.1	3.83	57.31	745.27
2.50	0.50	0.00	9866.48	4103.3	3.83	57.45	749.36
2.60	0.50	0.00	10250.25	4136.4	3.84	57.59	753.35
2.70	0.50	0.00	10634.70	4169.5	3.85	57.72	757.29
2.80	0.50	0.00	11019.83	4202.5	3.85	57.85	761.19
2.90	0.50	0.00	11405.63	4235.4	3.86	57.97	765.03
3.00	0.50	0.00	11792.07	4268.4	3.87	58.09	768.82
3.10	0.50	0.00	12179.17	4301.3	3.87	58.21	772.57
3.20	0.50	0.00	12566.88	4334.1	3.88	58.32	776.26
3.30	0.50	0.00	12955.22	4367.0	3.89	58.43	779.91
3.40	0.50	0.00	13344.17	4399.7	3.89	58.53	783.50
3.50	0.50	0.00	13733.70	4432.5	3.90	58.63	787.04
3.60	0.50	0.00	14123.82	4465.2	3.90	58.72	790.57
3.70	0.50	0.00	14514.53	4498.0	3.91	58.82	794.08
3.80	0.50	0.00	14905.81	4530.8	3.92	58.92	797.59
3.90	0.50	0.00	15297.68	4563.6	3.92	59.01	801.08
4.00	0.50	0.00	15690.07	4595.7	3.93	59.10	804.06
4.10	0.50	0.00	16082.95	4627.8	3.93	59.18	806.96
4.20	0.50	0.00	16476.29	4659.9	3.94	59.26	809.84
4.30	0.50	0.00	16870.11	4692.0	3.94	59.35	812.69
4.40	0.50	0.00	17264.38	4724.0	3.95	59.43	815.51
4.50	0.50	0.00	17659.12	4756.1	3.95	59.50	818.31
4.60	0.50	0.00	18054.29	4788.2	3.95	59.58	821.07

```
*****************************************************************************************************************
*                                              ***  MOSES   ***                                                *
*                                              ----------------                          3 April, 2017         *
*          RESPONSE AMPLITUDE OPERATOR DLB01 BARGE OF PT. TIMAS                                                *
*          FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI                                          *
*                                                                                                              *
*****************************************************************************************************************
```

+++ H Y D R O S T A T I C   C O E F F I C I E N T S +++

For Body DLB01

Process is DEFAULT: Units Are Degrees, Meters, and M-Tons Unless Specified

/--- Condition ---/			Displacement	Wetted Surface	Load To Change Draft 1 MM	/--- For KG = KB ----/ Moment To Change .01 Deg	
Draft	Trim	Roll				--- Heel ---	--- Trim ---
4.70	0.50	0.00	18449.92	4820.2	3.96	59.65	823.83

(halaman sengaja dikosongkan)

LAMPIRAN B

HASIL *OUTPUT SOFTWARE* MOSES

(*RAO*)

```
*****************************************************************************************************
*                                        ***  MOSES  ***                                            *
*                                        ---------------                     3 April, 2017          *
*          RESPONSE AMPLITUDE OPERATOR DLB01 BARGE OF PT. TIMAS                                     *
*          FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI                               *
*   Draft            =   4.7 Meters       Trim Angle       =   0.50 Deg.     GMT              =  12.9 Meters *
*   Roll Gy. Radius  =   7.8 Meters       Pitch Gy. Radius =  32.4 Meters    Yaw Gy. Radius   =  32.5 Meters *
*   Heading          =   0.00 Deg.        Forward Speed    =  0.00 Knots     Linearization Based on 1/ 20    *
*****************************************************************************************************
```

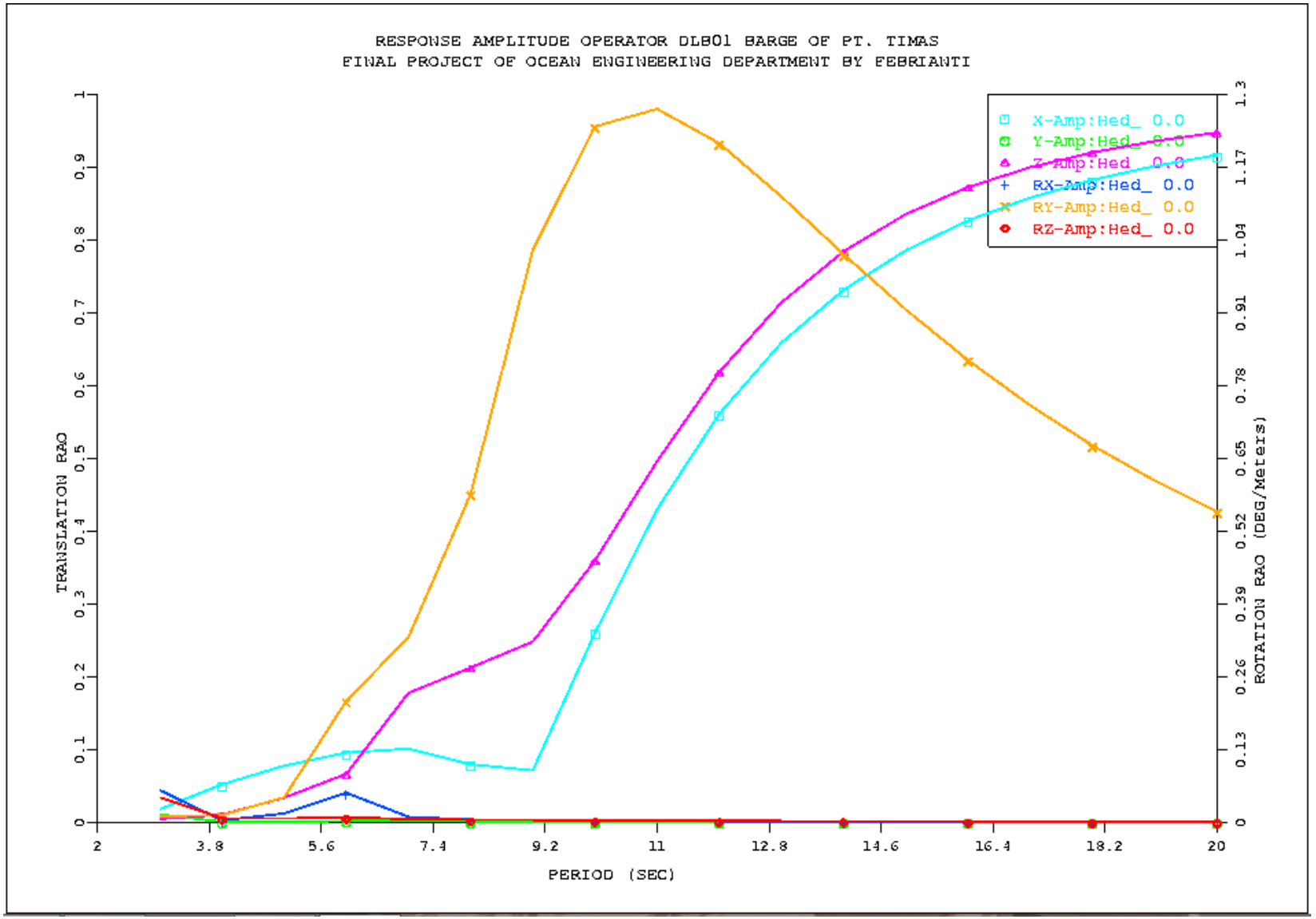
+++ M O T I O N   R E S P O N S E   O P E R A T O R S +++

Results are in Body System

Of Point On Body DLB01 At X = 66.0 Y = 0.0 Z = 8.5

Process is DEFAULT: Units Are Degrees, Meters, and M-Tons Unless Specified

E N C O U N T E R		Surge / Wave Ampl.		Sway / Wave Ampl.		Heave / Wave Ampl.		Roll / Wave Ampl.		Pitch / Wave Ampl.		Yaw / Wave Ampl.	
Frequency -(Rad/Sec)-	Period -(Sec)-	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase
0.3142	20.00	0.916	128	0.000	0	0.947	39	0.000	0	0.555	-54	0.002	-135
0.3307	19.00	0.901	132	0.001	32	0.935	43	0.000	0	0.610	-50	0.002	-129
0.3491	18.00	0.882	137	0.001	37	0.920	48	0.000	0	0.673	-46	0.002	-122
0.3696	17.00	0.858	143	0.001	43	0.900	53	0.000	0	0.745	-41	0.002	-115
0.3927	16.00	0.827	150	0.001	49	0.872	60	0.001	-89	0.825	-34	0.002	-105
0.4189	15.00	0.786	158	0.001	58	0.835	68	0.001	-81	0.916	-27	0.003	-94
0.4488	14.00	0.731	168	0.001	69	0.784	79	0.001	-71	1.014	-18	0.003	-79
0.4833	13.00	0.659	-179	0.001	82	0.714	92	0.002	-60	1.117	-7	0.003	-61
0.5236	12.00	0.561	-163	0.001	101	0.619	109	0.002	-45	1.212	7	0.004	-38
0.5712	11.00	0.430	-143	0.001	128	0.496	134	0.003	-27	1.273	25	0.004	-6
0.6283	10.00	0.261	-116	0.002	165	0.360	173	0.004	-5	1.242	48	0.005	35
0.6981	9.00	0.072	-67	0.002	-143	0.248	-123	0.005	22	1.022	83	0.005	92
0.7854	8.00	0.080	136	0.002	-67	0.213	-32	0.005	57	0.586	143	0.005	179
0.8976	7.00	0.102	-112	0.003	45	0.178	71	0.011	112	0.331	-82	0.007	-47
1.0472	6.00	0.096	100	0.002	171	0.067	-95	0.053	146	0.217	71	0.009	143
1.2566	5.00	0.078	63	0.001	131	0.034	-123	0.016	49	0.045	14	0.008	96
1.5708	4.00	0.053	-19	0.001	-137	0.011	127	0.004	142	0.013	-12	0.008	174
2.0944	3.00	0.018	0	0.011	-114	0.005	56	0.058	-86	0.012	-15	0.045	-121


RESPONSE AMPLITUDE OPERATOR DLB01 BARGE OF PT. TIMAS
FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI
X-Amp:Hed_ 0.0
Y-Amp:Hed_ 0.0
Z-Amp:Hed_ 0.0
RX-Amp:Hed_ 0.0
RY-Amp:Hed_ 0.0
RZ-Amp:Hed_ 0.0
TRANSLATION RAO
ROTATION RAO (DEG/Meters)
PERIOD (SEC)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.13
0.26
0.39
0.52
0.65
0.78
0.91
1.04
1.17
1.3
2
3.8
5.6
7.4
9.2
11
12.8
14.6
16.4
18.2
20

```
*****************************************************************************************************
*                                        ***  MOSES  ***                                            *
*                                        ---------------                       3 April, 2017        *
*          RESPONSE AMPLITUDE OPERATOR DLB01 BARGE OF PT. TIMAS                                     *
*          FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI                               *
*   Draft            =   4.7 Meters      Trim Angle       =   0.50 Deg.     GMT              =  12.9 Meters *
*   Roll Gy. Radius  =   7.8 Meters      Pitch Gy. Radius =  32.4 Meters    Yaw Gy. Radius   =  32.5 Meters *
*   Heading          =  45.00 Deg.       Forward Speed    =  0.00 Knots     Linearization Based on 1/ 20    *
*****************************************************************************************************
```

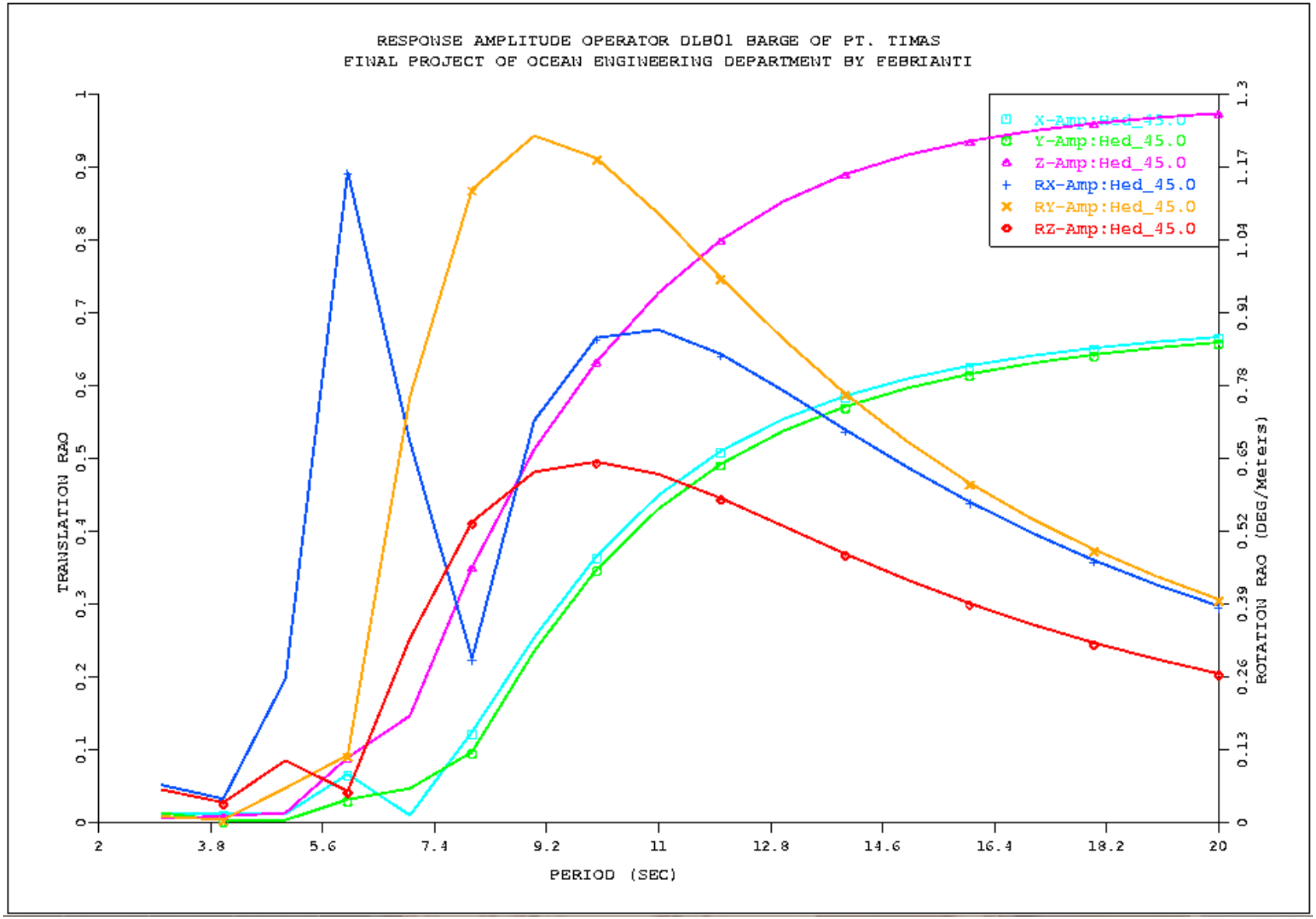
+++ M O T I O N   R E S P O N S E   O P E R A T O R S +++

Results are in Body System

Of Point On Body DLB01 At X = 66.0 Y = 0.0 Z = 8.5

Process is DEFAULT: Units Are Degrees, Meters, and M-Tons Unless Specified

E N C O U N T E R		Surge / Wave Ampl.		Sway / Wave Ampl.		Heave / Wave Ampl.		Roll / Wave Ampl.		Pitch / Wave Ampl.		Yaw / Wave Ampl.	
Frequency -(Rad/Sec)-	Period -(Sec)-	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase
0.3142	20.00	0.666	117	0.659	117	0.973	27	0.387	114	0.399	-64	0.266	-152
0.3307	19.00	0.660	120	0.652	120	0.967	30	0.425	117	0.440	-62	0.292	-149
0.3491	18.00	0.651	123	0.642	123	0.960	34	0.468	120	0.487	-58	0.321	-146
0.3696	17.00	0.641	127	0.631	127	0.949	38	0.517	123	0.542	-55	0.354	-142
0.3927	16.00	0.627	132	0.616	132	0.935	42	0.572	128	0.606	-50	0.391	-137
0.4189	15.00	0.609	138	0.596	138	0.916	48	0.634	133	0.680	-45	0.433	-132
0.4488	14.00	0.586	145	0.571	145	0.890	55	0.701	139	0.765	-39	0.480	-125
0.4833	13.00	0.554	153	0.537	154	0.852	64	0.771	147	0.863	-31	0.529	-116
0.5236	12.00	0.510	164	0.492	165	0.800	76	0.836	157	0.972	-21	0.579	-105
0.5712	11.00	0.450	178	0.431	180	0.727	91	0.879	170	1.086	-8	0.622	-90
0.6283	10.00	0.366	-163	0.348	-160	0.632	112	0.865	-172	1.186	7	0.644	-71
0.6981	9.00	0.254	-137	0.236	-134	0.512	141	0.717	-150	1.225	30	0.626	-43
0.7854	8.00	0.124	-100	0.097	-91	0.351	-176	0.293	-124	1.130	61	0.537	-3
0.8976	7.00	0.010	170	0.047	94	0.147	-101	0.680	109	0.760	105	0.328	56
1.0472	6.00	0.067	-138	0.032	-122	0.089	50	1.161	95	0.121	-154	0.056	-156
1.2566	5.00	0.012	48	0.004	109	0.013	-60	0.257	-5	0.062	116	0.111	95
1.5708	4.00	0.013	-82	0.003	150	0.009	81	0.043	80	0.005	-177	0.036	128
2.0944	3.00	0.013	67	0.013	-88	0.006	81	0.068	-62	0.011	-32	0.059	-87


RESPONSE AMPLITUDE OPERATOR DLB01 BARGE OF PT. TIMAS
FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI
X-Amp:Hed_45.0
Y-Amp:Hed_45.0
Z-Amp:Hed_45.0
RX-Amp:Hed_45.0
RY-Amp:Hed_45.0
RZ-Amp:Hed_45.0
TRANSLATION RAO
ROTATION RAO (DEG/Meters)
PERIOD (SEC)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.13
0.26
0.39
0.52
0.65
0.78
0.91
1.04
1.17
1.3
2
3.8
5.6
7.4
9.2
11
12.8
14.6
16.4
18.2
20

*** MOSES ***

3 April, 2017

RESPONSE AMPLITUDE OPERATOR DLB01 BARGE OF PT. TIMAS

FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI

Draft	= 4.7 Meters	Trim Angle	= 0.50 Deg.	GMT	= 12.9 Meters
Roll Gy. Radius	= 7.8 Meters	Pitch Gy. Radius	= 32.4 Meters	Yaw Gy. Radius	= 32.5 Meters
Heading	= 90.00 Deg.	Forward Speed	= 0.00 Knots	Linearization Based on 1/ 20	

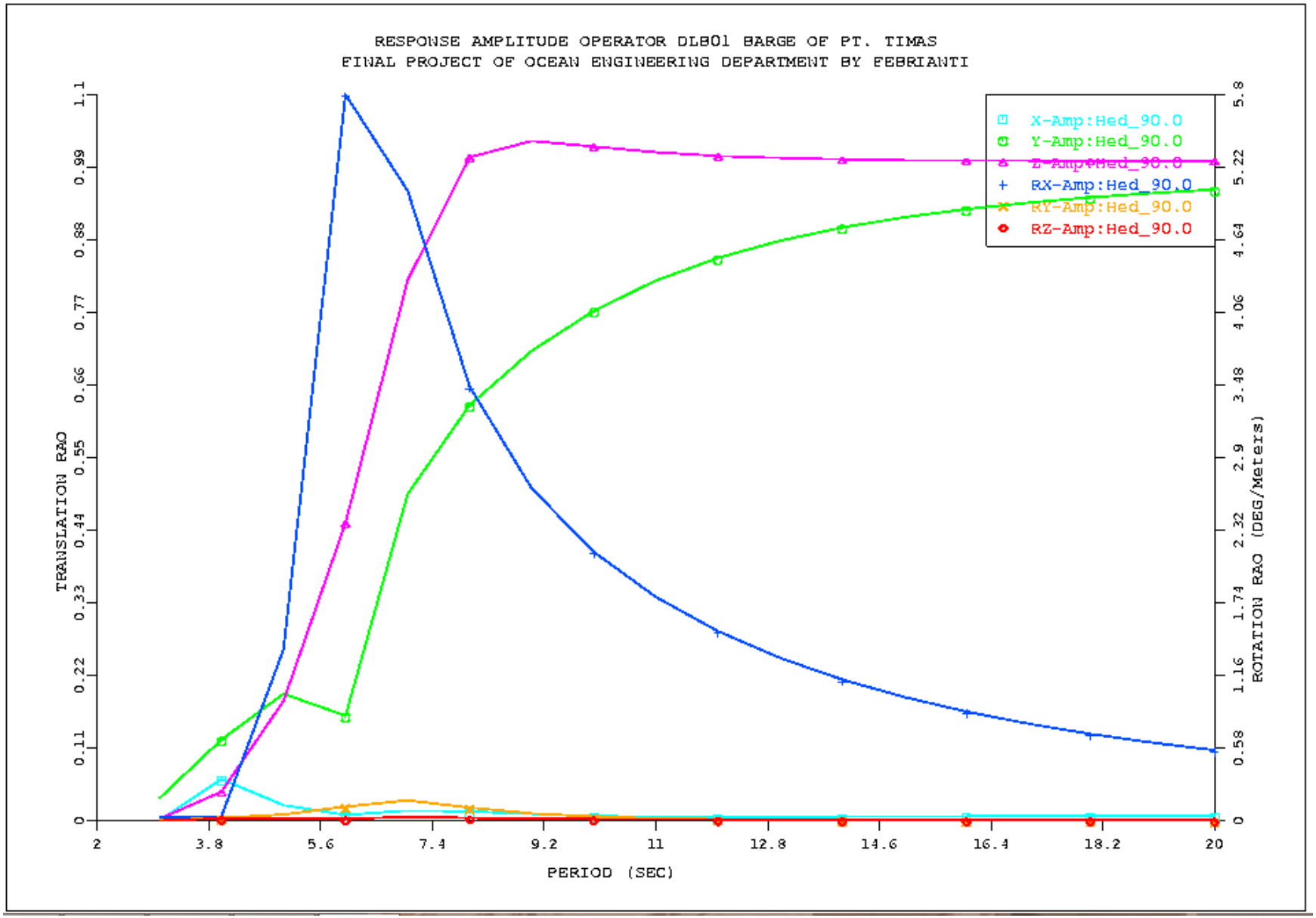
+++ M O T I O N R E S P O N S E O P E R A T O R S +++

Results are in Body System

Of Point On Body DLB01 At X = 66.0 Y = 0.0 Z = 8.5

Process is DEFAULT: Units Are Degrees, Meters, and M-Tons Unless Specified

E N C O U N T E R		Surge / Wave Ampl.		Sway / Wave Ampl.		Heave / Wave Ampl.		Roll / Wave Ampl.		Pitch / Wave Ampl.		Yaw / Wave Ampl.	
Frequency -(Rad/Sec)-	Period -(Sec)-	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase
0.3142	20.00	0.008	-177	0.956	90	1.000	0	0.564	90	0.000	0	0.004	-89
0.3307	19.00	0.008	-177	0.950	90	1.000	0	0.623	90	0.001	177	0.004	-89
0.3491	18.00	0.007	-176	0.944	90	1.000	0	0.693	90	0.001	177	0.005	-89
0.3696	17.00	0.007	-176	0.936	90	1.000	0	0.775	90	0.002	176	0.005	-89
0.3927	16.00	0.007	-175	0.926	90	1.000	0	0.871	90	0.002	175	0.006	-89
0.4189	15.00	0.007	-173	0.914	90	1.001	0	0.987	90	0.003	174	0.007	-89
0.4488	14.00	0.006	-170	0.898	90	1.002	0	1.128	89	0.005	172	0.007	-89
0.4833	13.00	0.006	-165	0.878	90	1.003	0	1.299	89	0.008	169	0.009	-89
0.5236	12.00	0.006	-156	0.852	91	1.007	0	1.513	90	0.012	165	0.010	-90
0.5712	11.00	0.006	-144	0.818	91	1.012	0	1.786	90	0.020	158	0.012	-90
0.6283	10.00	0.007	-132	0.772	92	1.021	-1	2.145	89	0.033	148	0.014	-91
0.6981	9.00	0.010	-129	0.712	93	1.029	-4	2.653	89	0.058	132	0.018	-93
0.7854	8.00	0.014	-140	0.629	94	1.005	-11	3.465	86	0.105	107	0.023	-98
0.8976	7.00	0.015	-174	0.495	93	0.818	-24	5.030	75	0.163	62	0.030	-116
1.0472	6.00	0.009	-116	0.159	113	0.451	-29	5.798	21	0.113	11	0.017	154
1.2566	5.00	0.024	-171	0.192	-178	0.181	-8	1.367	-6	0.050	19	0.014	-50
1.5708	4.00	0.063	171	0.123	-124	0.044	50	0.034	-88	0.022	99	0.018	52
2.0944	3.00	0.000	0	0.034	59	0.003	-128	0.025	-134	0.004	-124	0.001	59


RESPONSE AMPLITUDE OPERATOR DLB01 BARGE OF PT. TIMAS
FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI
X-Amp:Hed_90.0
Y-Amp:Hed_90.0
Z-Amp:Hed_90.0
RX-Amp:Hed_90.0
RY-Amp:Hed_90.0
RZ-Amp:Hed_90.0
TRANSLATION RAO
ROTATION RAO (DEG/Meters)
PERIOD (SEC)
0
0.11
0.22
0.33
0.44
0.55
0.66
0.77
0.88
0.99
1.1
0
0.58
1.16
1.74
2.32
2.9
3.48
4.06
4.64
5.22
5.8
2
3.8
5.6
7.4
9.2
11
12.8
14.6
16.4
18.2
20

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*****************************************************************************************************
*                                    ***  MOSES   ***                                               *
*                                    ----------------                       3 April, 2017           *
*          RESPONSE AMPLITUDE OPERATOR DLB01 BARGE OF PT. TIMAS                                     *
*          FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI                               *
*   Draft             =   4.7 Meters       Trim Angle       =   0.50 Deg.     GMT              =  12.9 Meters *
*   Roll Gy. Radius   =   7.8 Meters       Pitch Gy. Radius =  32.4 Meters    Yaw Gy. Radius   =  32.5 Meters *
*   Heading           = 135.00 Deg.        Forward Speed    =  0.00 Knots     Linearization Based on 1/ 20    *
*****************************************************************************************************
```

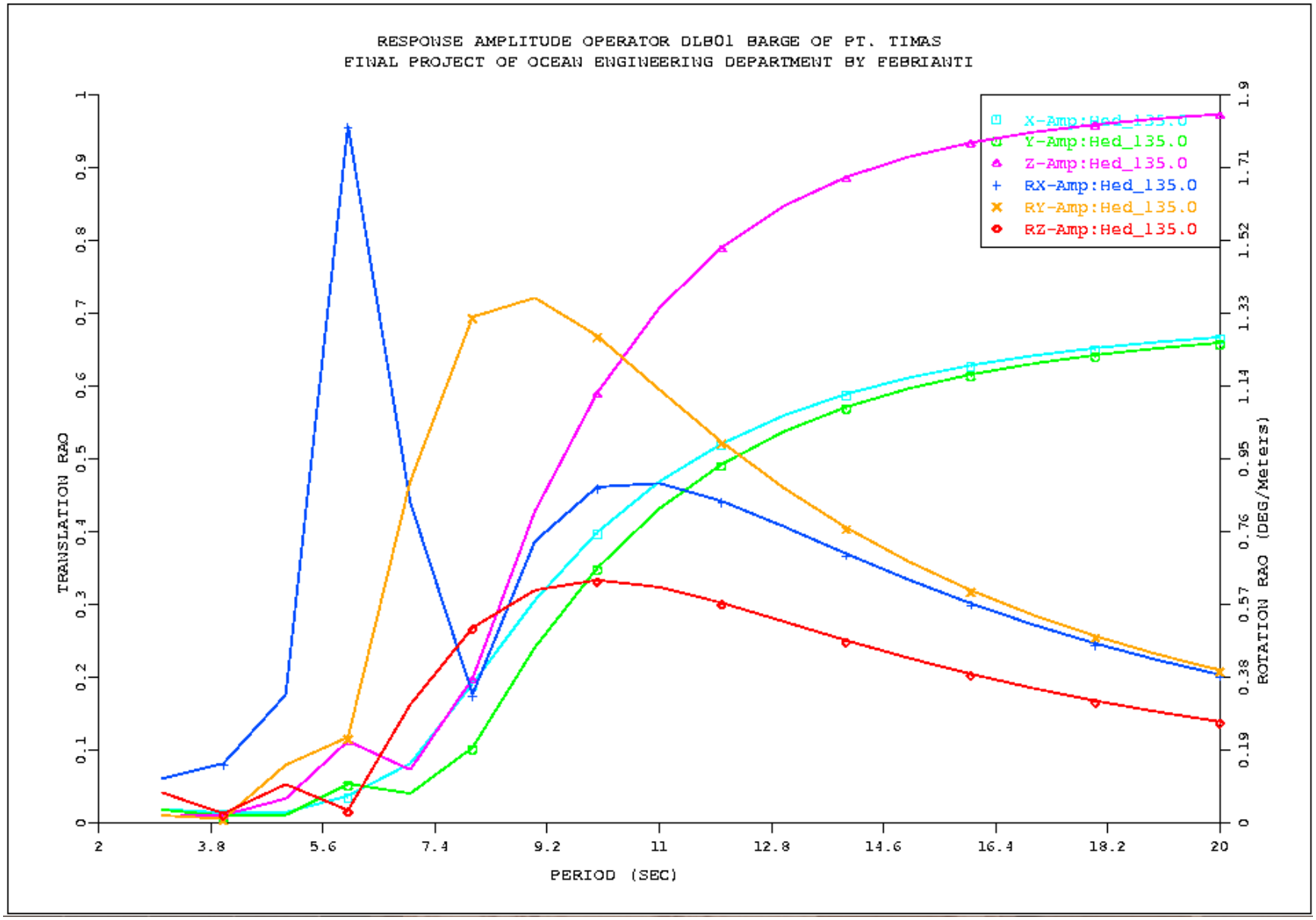
+++ M O T I O N   R E S P O N S E   O P E R A T O R S +++

Results are in Body System

Of Point On Body DLB01 At X = 66.0 Y = 0.0 Z = 8.5

Process is DEFAULT: Units Are Degrees, Meters, and M-Tons Unless Specified

E N C O U N T E R		Surge / Wave Ampl.		Sway / Wave Ampl.		Heave / Wave Ampl.		Roll / Wave Ampl.		Pitch / Wave Ampl.		Yaw / Wave Ampl.	
Frequency -(Rad/Sec)-	Period -(Sec)-	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase
0.3142	20.00	0.667	-117	0.659	63	0.973	-26	0.387	66	0.399	65	0.265	-26
0.3307	19.00	0.660	-120	0.652	60	0.967	-29	0.425	63	0.440	63	0.290	-29
0.3491	18.00	0.652	-123	0.642	57	0.959	-33	0.468	60	0.488	59	0.319	-32
0.3696	17.00	0.642	-127	0.631	53	0.948	-37	0.517	56	0.543	56	0.352	-36
0.3927	16.00	0.628	-132	0.616	48	0.934	-42	0.573	52	0.607	52	0.389	-41
0.4189	15.00	0.611	-138	0.596	42	0.914	-48	0.635	47	0.682	46	0.430	-46
0.4488	14.00	0.589	-145	0.571	35	0.887	-55	0.702	40	0.770	40	0.476	-53
0.4833	13.00	0.559	-153	0.537	27	0.847	-64	0.773	33	0.874	32	0.525	-62
0.5236	12.00	0.521	-164	0.492	16	0.790	-75	0.840	23	0.994	22	0.574	-73
0.5712	11.00	0.469	-178	0.432	2	0.707	-89	0.886	11	1.130	10	0.615	-86
0.6283	10.00	0.399	162	0.350	-15	0.590	-108	0.877	-3	1.271	-7	0.634	-104
0.6981	9.00	0.305	135	0.241	-39	0.428	-134	0.735	-22	1.370	-31	0.607	-126
0.7854	8.00	0.192	95	0.103	-72	0.199	-173	0.336	-30	1.320	-64	0.509	-156
0.8976	7.00	0.082	15	0.041	50	0.073	-54	0.836	51	0.891	-113	0.309	161
1.0472	6.00	0.037	-134	0.054	-43	0.113	-129	1.819	-68	0.224	-124	0.033	46
1.2566	5.00	0.015	-25	0.011	159	0.034	-129	0.335	-89	0.152	-139	0.101	170
1.5708	4.00	0.014	-160	0.010	114	0.011	-60	0.155	-88	0.011	-85	0.025	141
2.0944	3.00	0.019	121	0.018	-12	0.009	163	0.115	9	0.020	10	0.080	-22


RESPONSE AMPLITUDE OPERATOR DLB01 BARGE OF PT. TIMAS
FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI
X-Amp:Hed_135.0
Y-Amp:Hed_135.0
Z-Amp:Hed_135.0
RX-Amp:Hed_135.0
RY-Amp:Hed_135.0
RZ-Amp:Hed_135.0
TRANSLATION RAO
ROTATION RAO (DEG/Meters)
PERIOD (SEC)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.19
0.38
0.57
0.76
0.95
1.14
1.33
1.52
1.71
1.9
2
3.8
5.6
7.4
9.2
11
12.8
14.6
16.4
18.2
20

```
***************************************************************************************************
*                                          ***  MOSES  ***                                        *
*                                          ----------------                    3 April, 2017      *
*          RESPONSE AMPLITUDE OPERATOR DLB01 BARGE OF PT. TIMAS                                   *
*          FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI                             *
*   Draft             =   4.7 Meters       Trim Angle       =   0.50 Deg.     GMT              =  12.9 Meters *
*   Roll Gy. Radius   =   7.8 Meters       Pitch Gy. Radius =  32.4 Meters    Yaw Gy. Radius   =  32.5 Meters *
*   Heading           = 180.00 Deg.        Forward Speed    =  0.00 Knots     Linearization Based on 1/ 20    *
***************************************************************************************************
```

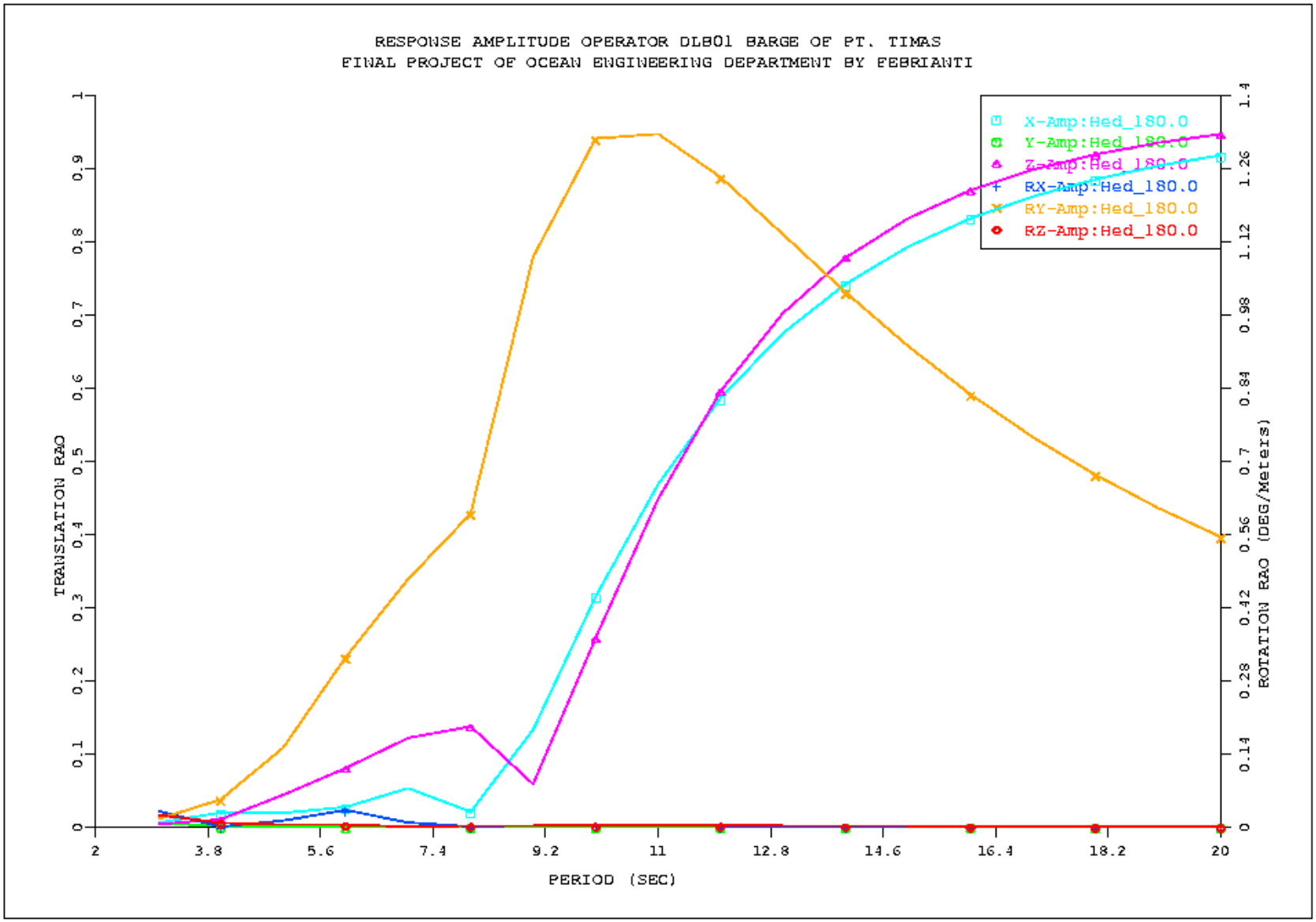
+++ M O T I O N   R E S P O N S E   O P E R A T O R S +++

Results are in Body System

Of Point On Body DLB01 At X = 66.0 Y = 0.0 Z = 8.5

Process is DEFAULT: Units Are Degrees, Meters, and M-Tons Unless Specified

E N C O U N T E R		Surge / Wave Ampl.		Sway / Wave Ampl.		Heave / Wave Ampl.		Roll / Wave Ampl.		Pitch / Wave Ampl.		Yaw / Wave Ampl.	
Frequency -(Rad/Sec)-	Period -(Sec)-	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase
0.3142	20.00	0.918	-127	0.000	0	0.947	-38	0.000	0	0.556	55	0.002	138
0.3307	19.00	0.903	-131	0.001	-52	0.935	-42	0.000	0	0.611	51	0.002	133
0.3491	18.00	0.885	-136	0.001	-59	0.919	-47	0.000	0	0.674	47	0.002	126
0.3696	17.00	0.862	-142	0.001	-68	0.898	-53	0.001	79	0.746	42	0.002	119
0.3927	16.00	0.832	-149	0.001	-78	0.870	-60	0.001	70	0.828	35	0.002	110
0.4189	15.00	0.793	-157	0.001	-91	0.832	-68	0.001	59	0.920	28	0.003	100
0.4488	14.00	0.742	-167	0.001	-106	0.778	-78	0.001	45	1.023	19	0.003	87
0.4833	13.00	0.675	180	0.001	-125	0.702	-91	0.002	29	1.134	8	0.003	71
0.5236	12.00	0.586	164	0.001	-149	0.596	-107	0.002	8	1.243	-6	0.004	52
0.5712	11.00	0.469	144	0.001	178	0.448	-128	0.003	-18	1.326	-24	0.004	29
0.6283	10.00	0.315	116	0.001	137	0.259	-151	0.004	-53	1.317	-49	0.004	0
0.6981	9.00	0.133	78	0.001	81	0.059	-149	0.004	-100	1.091	-80	0.004	-38
0.7854	8.00	0.021	-150	0.001	-7	0.138	-83	0.002	-103	0.600	-107	0.003	-100
0.8976	7.00	0.054	132	0.001	175	0.122	-134	0.009	-143	0.475	-95	0.001	102
1.0472	6.00	0.028	-141	0.001	-103	0.081	-125	0.033	-135	0.325	-146	0.006	-121
1.2566	5.00	0.020	-164	0.001	-124	0.044	-153	0.013	152	0.152	-163	0.005	-155
1.5708	4.00	0.020	-128	0.002	40	0.011	-179	0.001	-124	0.053	-172	0.009	-12
2.0944	3.00	0.006	8	0.006	-162	0.004	116	0.031	-134	0.016	153	0.024	-169


RESPONSE AMPLITUDE OPERATOR DL801 BARGE OF PT. TIMAS
FINAL PROJECT OF OCEAN ENGINEERING DEPARTMENT BY FEBRIANTI
X-Amp:Hed_180.0
Y-Amp:Hed_180.0
Z-Amp:Hed_180.0
RX-Amp:Hed_180.0
RY-Amp:Hed_180.0
RZ-Amp:Hed_180.0
TRANSLATION RAO
ROTATION RAO (DEG/Meters)
PERIOD (SEC)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.14
0.28
0.42
0.56
0.7
0.84
0.98
1.12
1.26
1.4
2
3.8
5.6
7.4
9.2
11
12.8
14.6
16.4
18.2
20

LAMPIRAN C-1

HASIL *OUTPUT SOFTWARE OFFPIPE*

(*WATER DEPTH* = 109 M)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.95	.00	19.62	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	16.39	.00	-7.59	.00	22.84	5.10
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	16.37	.00	-6.61	.00	21.98	4.91
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	16.34	.00	-21.15	.00	34.32	7.66
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	16.31	.00	-64.73	.00	71.33	15.92
13	LAYBARGE	44.91	4.73	.00	.000	2.151	51.425	16.30	.00	-71.65	.00	77.20	17.23
14	TENSIONR	35.35	4.30	.00	.000	3.173	60.993	32.76	.00	-159.75	.00	168.55	37.62
16	LAYBARGE	23.34	3.42	.00	.000	5.432	73.039	32.57	.00	-261.47	.00	254.82	56.88
18	LAYBARGE	8.89	1.61	.00	.000	8.937	87.606	32.24	.00	-323.21	.00	306.97	68.52
20	LAYBARGE	3.11	.61	.00	.000	10.763	93.474	32.06	.00	-345.91	.00	326.08	72.79
24	STINGER	-7.61	-1.71	.00	.000	13.429	104.439	31.81	-.27	-200.55	.00	202.41	45.18
26	STINGER	-16.47	-3.96	.00	.000	15.079	113.583	31.51	-.64	-196.21	.00	198.61	44.33
29	STINGER	-26.10	-6.70	.00	.000	16.517	123.590	31.17	-1.08	-123.86	.00	136.99	30.58
32	STINGER	-34.84	-9.38	.00	.000	17.626	132.734	30.80	-1.51	-144.58	.00	154.45	34.48
35	STINGER	-44.23	-12.49	.00	.000	19.009	142.624	30.38	-2.00	-166.72	.00	173.11	38.64
38	STINGER	-52.83	-15.59	.00	.000	20.907	151.768	29.91	-2.50	-288.29	.00	276.22	61.66
41	STINGER	-61.94	-19.30	.00	.000	23.349	161.608	29.43	-3.10	-257.84	.00	250.16	55.84
43	STINGER	-71.77	-23.81	.00	.000	25.915	172.418	28.83	-3.82	-269.56	.00	259.88	58.01
45	STINGER	-74.59	-25.20	.00	.000	26.621	175.572	28.67	-4.05	-202.49	.00	202.84	45.28
47	SAGBEND	-85.36	-30.79	.00	.000	27.903	187.696	27.96	-4.94	-41.21	.00	65.61	14.64
48	SAGBEND	-96.13	-36.51	.00	.000	27.897	199.896	27.20	-5.86	32.66	.00	58.12	12.97
49	SAGBEND	-106.94	-42.16	.00	.000	27.295	212.095	26.44	-6.77	66.74	.00	86.76	19.37
50	SAGBEND	-117.82	-47.68	.00	.000	26.415	224.295	25.70	-7.65	82.94	.00	100.25	22.38
51	SAGBEND	-128.79	-53.01	.00	.000	25.401	236.495	24.99	-8.51	91.03	.00	106.88	23.86
52	SAGBEND	-139.86	-58.14	.00	.000	24.317	248.695	24.31	-9.33	95.43	.00	110.38	24.64
53	SAGBEND	-151.03	-63.06	.00	.000	23.193	260.895	23.65	-10.12	98.12	.00	112.46	25.10
54	SAGBEND	-162.29	-67.75	.00	.000	22.043	273.095	23.02	-10.88	100.04	.00	113.89	25.42
55	SAGBEND	-173.64	-72.21	.00	.000	20.873	285.295	22.43	-11.59	101.60	.00	115.02	25.67
56	SAGBEND	-185.09	-76.44	.00	.000	19.686	297.495	21.86	-12.27	102.99	.00	116.03	25.90
57	SAGBEND	-196.62	-80.43	.00	.000	18.484	309.695	21.33	-12.91	104.28	.00	116.96	26.11
58	SAGBEND	-208.23	-84.17	.00	.000	17.266	321.895	20.83	-13.51	105.51	.00	117.85	26.31
59	SAGBEND	-219.92	-87.67	.00	.000	16.035	334.095	20.36	-14.08	106.68	.00	118.71	26.50
60	SAGBEND	-231.68	-90.91	.00	.000	14.791	346.296	19.93	-14.60	107.79	.00	119.52	26.68
61	SAGBEND	-243.51	-93.90	.00	.000	13.534	358.496	19.53	-15.07	108.84	.00	120.29	26.85
62	SAGBEND	-255.40	-96.62	.00	.000	12.266	370.696	19.17	-15.51	109.81	.00	121.01	27.01
63	SAGBEND	-267.35	-99.08	.00	.000	10.987	382.896	18.84	-15.91	110.67	.00	121.65	27.15
64	SAGBEND	-279.35	-101.27	.00	.000	9.698	395.096	18.55	-16.26	111.41	.00	122.19	27.27
65	SAGBEND	-291.40	-103.19	.00	.000	8.402	407.296	18.29	-16.57	111.95	.00	122.57	27.36
66	SAGBEND	-303.49	-104.84	.00	.000	7.102	419.496	18.07	-16.83	112.16	.00	122.69	27.39
67	SAGBEND	-315.61	-106.21	.00	.000	5.801	431.697	17.89	-17.05	111.81	.00	122.34	27.31
68	SAGBEND	-327.76	-107.30	.00	.000	4.511	443.897	17.74	-17.23	110.36	.00	121.08	27.03
69	SAGBEND	-339.93	-108.13	.00	.000	3.249	456.097	17.63	-17.36	106.73	.00	118.00	26.34
70	SAGBEND	-352.12	-108.69	.00	.000	2.051	468.298	17.56	-17.45	98.65	.00	111.17	24.81
71	SAGBEND	-364.31	-109.01	.00	.000	.994	480.498	17.52	-17.50	81.34	.00	96.61	21.56
72	SEABED	-376.51	-109.13	.00	.000	.236	492.699	17.51	-17.52	44.80	.00	66.12	14.76
73	SEABED	-388.72	-109.15	.00	.000	-.019	504.899	17.51	-17.52	5.11	.00	34.17	7.63
74	SEABED	-400.92	-109.14	.00	.000	-.017	517.099	17.51	-17.52	-2.03	.00	31.84	7.11
75	SEABED	-413.12	-109.14	.00	.000	-.001	529.299	17.51	-17.52	-.57	.00	30.76	6.87
76	SEABED	-425.32	-109.14	.00	.000	.001	541.499	17.51	-17.52	.05	.00	30.37	6.78
77	SEABED	-437.52	-109.14	.00	.000	.000	553.699	17.51	-17.52	.04	.00	30.37	6.78
78	SEABED	-449.72	-109.14	.00	.000	.000	565.899	17.51	-17.52	.00	.00	30.34	6.77
79	SEABED	-461.92	-109.14	.00	.000	.000	578.099	17.51	-17.52	.00	.00	30.34	6.77
80	SEABED	-474.12	-109.14	.00	.000	.000	590.299	17.51	-17.52	.00	.00	30.34	6.77
81	SEABED	-486.32	-109.14	.00	.000	.000	602.499	17.51	-17.52	.00	.00	30.34	6.77
82	SEABED	-498.52	-109.14	.00	.000	.000	614.699	17.51	-17.52	.00	.00	30.34	6.77
83	SEABED	-510.72	-109.14	.00	.000	.000	626.899	17.51	-17.52	.00	.00	30.34	6.77

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.47	.00	.00	.00	-1.36	-77.24	.00	77.24
5	LAYBARGE	73.45	5.65	.00	50.06	.00	.00	.00	-2.64	-67.31	.00	67.31
7	TENSIONR	60.11	5.23	.00	43.31	.00	.00	.00	402.77	-22.26	.00	22.26
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	402.39	-19.37	.00	19.37
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	401.60	-62.03	.00	62.03
11	LAYBARGE	46.45	4.79	.00	36.92	.00	.00	.00	400.85	-189.83	.00	189.83
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	400.61	-210.10	.00	210.10
14	TENSIONR	35.35	4.30	.00	72.93	.00	.00	.00	805.31	-468.47	.00	468.47
16	LAYBARGE	23.34	3.42	.00	107.13	.00	.00	.00	800.66	-766.75	.00	766.75
18	LAYBARGE	8.89	1.61	.00	78.16	.00	.00	.00	792.49	-947.81	.00	947.81
20	LAYBARGE	3.11	.61	.00	105.93	.00	.00	.00	788.01	-1014.36	.00	1014.36
24	STINGER	-7.61	-1.71	.00	6.41	.00	.00	.00	785.33	-588.10	.00	588.10
26	STINGER	-16.47	-3.96	.00	53.44	.00	.00	.00	782.57	-575.40	.00	575.40
29	STINGER	-26.10	-6.70	.00	.00	.00	.01	.00	779.73	-363.21	.00	363.21
32	STINGER	-34.84	-9.38	.00	28.49	.00	.00	.00	776.26	-423.98	.00	423.98
35	STINGER	-44.23	-12.49	.00	.00	.00	.02	.00	772.23	-488.91	.00	488.91
38	STINGER	-52.83	-15.59	.00	90.11	.00	.00	.00	767.02	-845.41	.00	845.41
41	STINGER	-61.94	-19.30	.00	32.64	.00	.00	.00	762.81	-756.10	.00	756.10
43	STINGER	-71.77	-23.81	.00	96.13	.00	.00	.00	757.05	-790.48	.00	790.48
45	STINGER	-74.59	-25.20	.00	.00	.00	.52	.00	756.09	-593.79	.00	593.79
47	SAGBEND	-85.36	-30.79	.00	.00	.00	.00	.00	750.11	-120.85	.00	120.85
48	SAGBEND	-96.13	-36.51	.00	.00	.00	.00	.00	743.00	95.78	.00	95.78
49	SAGBEND	-106.94	-42.16	.00	.00	.00	.00	.00	735.88	195.73	.00	195.73
50	SAGBEND	-117.82	-47.68	.00	.00	.00	.00	.00	728.97	243.21	.00	243.21
51	SAGBEND	-128.79	-53.01	.00	.00	.00	.00	.00	722.30	266.95	.00	266.95
52	SAGBEND	-139.86	-58.14	.00	.00	.00	.00	.00	715.90	279.84	.00	279.84
53	SAGBEND	-151.03	-63.06	.00	.00	.00	.00	.00	709.77	287.74	.00	287.74
54	SAGBEND	-162.29	-67.75	.00	.00	.00	.00	.00	703.93	293.37	.00	293.37
55	SAGBEND	-173.64	-72.21	.00	.00	.00	.00	.00	698.37	297.95	.00	297.95
56	SAGBEND	-185.09	-76.44	.00	.00	.00	.00	.00	693.10	302.02	.00	302.02
57	SAGBEND	-196.62	-80.43	.00	.00	.00	.00	.00	688.13	305.81	.00	305.81
58	SAGBEND	-208.23	-84.17	.00	.00	.00	.00	.00	683.47	309.41	.00	309.41
59	SAGBEND	-219.92	-87.67	.00	.00	.00	.00	.00	679.12	312.84	.00	312.84
60	SAGBEND	-231.68	-90.91	.00	.00	.00	.00	.00	675.08	316.11	.00	316.11
61	SAGBEND	-243.51	-93.90	.00	.00	.00	.00	.00	671.36	319.17	.00	319.17
62	SAGBEND	-255.40	-96.62	.00	.00	.00	.00	.00	667.96	322.01	.00	322.01
63	SAGBEND	-267.35	-99.08	.00	.00	.00	.00	.00	664.90	324.55	.00	324.55
64	SAGBEND	-279.35	-101.27	.00	.00	.00	.00	.00	662.17	326.70	.00	326.70
65	SAGBEND	-291.40	-103.19	.00	.00	.00	.00	.00	659.78	328.28	.00	328.28
66	SAGBEND	-303.49	-104.84	.00	.00	.00	.00	.00	657.74	328.92	.00	328.92
67	SAGBEND	-315.61	-106.21	.00	.00	.00	.00	.00	656.03	327.88	.00	327.88
68	SAGBEND	-327.76	-107.30	.00	.00	.00	.00	.00	654.68	323.63	.00	323.63
69	SAGBEND	-339.93	-108.13	.00	.00	.00	.00	.00	653.67	313.00	.00	313.00
70	SAGBEND	-352.12	-108.69	.00	.00	.00	.00	.00	653.01	289.30	.00	289.30
71	SAGBEND	-364.31	-109.01	.00	.00	.00	.00	.00	652.69	238.54	.00	238.54
72	SEABED	-376.51	-109.13	.00	8.34	.00	.00	.00	652.65	131.39	.00	131.39
73	SEABED	-388.72	-109.15	.00	22.31	.00	.00	.00	652.69	15.00	.00	15.00
74	SEABED	-400.92	-109.14	.00	17.35	.00	.00	.00	652.69	-5.95	.00	5.95
75	SEABED	-413.12	-109.14	.00	15.03	.00	.00	.00	652.69	-1.68	.00	1.68
76	SEABED	-425.32	-109.14	.00	15.03	.00	.00	.00	652.69	.14	.00	.14
77	SEABED	-437.52	-109.14	.00	15.16	.00	.00	.00	652.69	.12	.00	.12
78	SEABED	-449.72	-109.14	.00	15.18	.00	.00	.00	652.69	.01	.00	.01
79	SEABED	-461.92	-109.14	.00	15.18	.00	.00	.00	652.69	-.01	.00	.01
80	SEABED	-474.12	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
81	SEABED	-486.32	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
82	SEABED	-498.52	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
83	SEABED	-510.72	-109.14	.00	.00	.00	.00	.00	652.69	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.32	6.29	0.00	0.000	1.578	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.29	5.96	0.00	0.000	1.574	12.04	-0.0001	0.0000	-0.0136	0.0000	0.0136	0.00
5	LAYBARGE	73.46	5.65	0.00	0.000	1.747	22.87	-0.0001	0.0000	-0.0112	0.0000	0.0113	0.00
7	TENSIONR	60.12	5.23	0.00	0.000	1.777	36.22	0.0087	0.0000	-0.0037	0.0000	0.0124	0.00
9	LAYBARGE	57.09	5.14	0.00	0.000	1.810	39.25	0.0087	0.0000	-0.0033	0.0000	0.0119	0.00
10	LAYBARGE	51.10	4.95	0.00	0.000	1.865	45.24	0.0087	0.0000	-0.0106	0.0000	0.0191	0.00
11	LAYBARGE	46.46	4.79	0.00	0.000	2.050	49.89	0.0087	0.0000	-0.0317	0.0000	0.0403	0.00
13	LAYBARGE	44.92	4.73	0.00	0.000	2.152	51.42	0.0087	0.0000	-0.0350	0.0000	0.0435	0.00
14	TENSIONR	35.37	4.30	0.00	0.000	3.174	60.99	0.0168	0.0000	-0.0777	0.0000	0.0942	0.00
16	LAYBARGE	23.36	3.42	0.00	0.000	5.433	73.04	0.0167	0.0000	-0.1298	0.0000	0.1460	0.00
18	LAYBARGE	8.91	1.61	0.00	0.000	8.926	87.61	0.0166	0.0000	-0.1644	0.0000	0.1806	0.00
20	LAYBARGE	3.12	0.61	0.00	0.000	10.658	93.47	0.0165	0.0000	-0.2813	0.0000	0.2973	0.00
24	STINGER	-7.60	-1.71	0.00	0.000	13.549	104.44	0.0164	-0.0001	-0.1368	0.0000	0.1517	0.00
26	STINGER	-16.46	-3.99	0.00	0.000	15.395	113.58	0.0163	-0.0003	-0.1870	0.0000	0.2018	0.00
29	STINGER	-26.09	-6.82	0.00	0.000	16.787	123.61	0.0162	-0.0006	-0.0924	0.0000	0.1070	0.00
32	STINGER	-34.83	-9.54	0.00	0.000	17.832	132.75	0.0160	-0.0008	-0.1260	0.0000	0.1418	0.00
35	STINGER	-44.24	-12.62	0.00	0.000	19.054	142.66	0.0158	-0.0010	-0.1809	0.0000	0.1964	0.00
38	STINGER	-52.83	-15.73	0.00	0.000	21.020	151.81	0.0156	-0.0012	-0.1845	0.0000	0.2001	0.00
41	STINGER	-61.92	-19.41	0.00	0.000	23.338	161.65	0.0154	-0.0015	-0.1687	0.0001	0.1830	0.00
43	STINGER	-71.76	-23.95	0.00	0.000	26.079	172.46	0.0151	-0.0019	-0.1643	-0.0003	0.1795	0.00
45	STINGER	-74.57	-25.34	0.00	0.000	26.747	175.59	0.0150	-0.0020	-0.1274	-0.0002	0.1415	0.00
47	SAGBEND	-85.31	-30.94	0.00	0.000	27.978	187.70	0.0147	-0.0024	-0.0386	-0.0001	0.0528	0.00
48	SAGBEND	-96.07	-36.65	0.00	0.000	27.958	199.90	0.0143	-0.0029	0.0338	-0.0001	0.0491	0.00
49	SAGBEND	-106.88	-42.29	0.00	0.000	27.373	212.10	0.0140	-0.0033	0.0494	-0.0001	0.0645	0.00
50	SAGBEND	-117.78	-47.78	0.00	-0.001	26.449	224.30	0.0136	-0.0037	0.0560	-0.0001	0.0711	0.00
51	SAGBEND	-128.76	-53.13	0.00	-0.001	25.351	236.50	0.0133	-0.0042	0.0585	-0.0001	0.0734	0.00
52	SAGBEND	-139.82	-58.30	0.00	0.000	24.267	248.70	0.0130	-0.0046	0.0615	-0.0001	0.0751	0.00
53	SAGBEND	-150.99	-63.22	0.00	0.000	23.134	260.90	0.0127	-0.0049	0.0602	0.0001	0.0745	0.00
54	SAGBEND	-162.26	-67.90	0.00	0.000	22.018	273.10	0.0124	-0.0053	0.0613	0.0001	0.0748	0.00
55	SAGBEND	-173.62	-72.34	0.00	0.000	20.786	285.30	0.0121	-0.0056	0.0607	-0.0001	0.0745	0.00
56	SAGBEND	-185.06	-76.55	0.00	0.000	19.646	297.50	0.0119	-0.0060	0.0621	-0.0001	0.0750	0.00
57	SAGBEND	-196.60	-80.52	0.00	0.000	18.469	309.70	0.0116	-0.0063	0.0623	-0.0001	0.0749	0.00
58	SAGBEND	-208.21	-84.28	0.00	0.000	17.209	321.90	0.0114	-0.0066	0.0611	-0.0001	0.0743	0.00
59	SAGBEND	-219.89	-87.83	0.00	0.000	15.966	334.10	0.0111	-0.0068	0.0624	-0.0001	0.0770	0.00
60	SAGBEND	-231.65	-91.07	0.00	0.000	14.729	346.30	0.0109	-0.0071	0.0646	-0.0001	0.0787	0.00
61	SAGBEND	-243.48	-94.03	0.00	0.000	13.522	358.49	0.0108	-0.0073	0.0658	-0.0002	0.0799	0.00
62	SAGBEND	-255.38	-96.72	0.00	0.000	12.159	370.69	0.0106	-0.0075	0.0652	-0.0001	0.0792	0.00
63	SAGBEND	-267.34	-99.14	0.00	-0.001	10.855	382.89	0.0105	-0.0077	0.0639	-0.0001	0.0776	0.00
64	SAGBEND	-279.35	-101.31	0.00	0.000	9.610	395.09	0.0104	-0.0079	0.0637	-0.0001	0.0773	0.00
65	SAGBEND	-291.39	-103.23	0.00	0.000	8.376	407.29	0.0103	-0.0080	0.0619	0.0001	0.0759	0.00
66	SAGBEND	-303.48	-104.86	0.00	0.000	7.114	419.49	0.0102	-0.0082	0.0633	0.0001	0.0762	0.00
67	SAGBEND	-315.60	-106.23	0.00	0.000	5.786	431.69	0.0101	-0.0083	0.0647	0.0002	0.0777	0.00
68	SAGBEND	-327.75	-107.34	0.00	0.000	4.443	443.89	0.0101	-0.0084	0.0672	-0.0002	0.0806	0.00
69	SAGBEND	-339.93	-108.15	0.00	0.000	3.253	456.09	0.0101	-0.0084	0.0659	-0.0002	0.0778	0.00
70	SAGBEND	-352.11	-108.70	0.00	0.000	1.997	468.29	0.0100	-0.0085	0.0575	-0.0001	0.0700	0.00
71	SAGBEND	-364.31	-109.00	0.00	-0.001	0.981	480.49	0.0100	-0.0085	0.0439	-0.0001	0.0578	0.00
72	SEABED	-376.51	-109.13	0.00	-0.001	0.336	492.69	0.0101	-0.0085	0.0294	0.0002	0.0434	0.00
73	SEABED	-388.71	-109.17	0.00	0.000	0.047	504.89	0.0101	-0.0085	0.0130	0.0001	0.0275	0.00
74	SEABED	-400.91	-109.17	0.00	0.000	-0.027	517.09	0.0101	-0.0085	0.0023	0.0000	0.0174	0.00
75	SEABED	-413.11	-109.17	0.00	0.000	-0.012	529.29	0.0101	-0.0085	-0.0010	0.0000	0.0169	0.00
76	SEABED	-425.31	-109.17	0.00	0.000	-0.002	541.49	0.0102	-0.0085	-0.0005	0.0000	0.0164	0.00
77	SEABED	-437.51	-109.17	0.00	0.000	0.000	553.69	0.0102	-0.0085	-0.0001	0.0000	0.0162	0.00
78	SEABED	-449.71	-109.17	0.00	0.000	0.000	565.89	0.0102	-0.0085	0.0001	0.0000	0.0162	0.00
79	SEABED	-461.91	-109.17	0.00	0.000	0.000	578.09	0.0102	-0.0085	0.0000	0.0000	0.0162	0.00
80	SEABED	-474.11	-109.17	0.00	0.000	0.000	590.29	0.0102	-0.0085	0.0000	0.0000	0.0162	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT VERT (KN)	REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	HORIZ (KN-M)	TOTAL (KN-M)
1	LAYBARGE	96.32	6.29	0.00	16.82	0.00	0.00	0.00	0.00	4.65	0.00	4.65
3	LAYBARGE	84.29	5.96	0.00	57.01	0.00	0.00	0.00	-3.82	-82.61	0.00	82.61
5	LAYBARGE	73.46	5.65	0.00	50.48	0.00	0.00	0.00	-7.33	-68.23	0.00	68.23
7	TENSIONR	60.12	5.23	0.00	43.72	0.01	0.00	0.00	443.72	-22.64	0.00	22.64

9	LAYBARGE	57.09	5.14	0.00	0.00	0.00	0.00	0.00	443.36	-20.08	0.00	20.08
10	LAYBARGE	51.10	4.95	0.00	0.00	0.00	0.00	0.00	442.60	-64.14	0.01	64.14
11	LAYBARGE	46.46	4.79	0.00	37.92	0.01	0.00	0.00	441.88	-192.62	0.01	192.62
13	LAYBARGE	44.92	4.73	0.00	0.00	0.00	0.00	0.00	441.64	-212.57	0.02	212.57
14	TENSIONR	35.37	4.30	0.00	75.81	0.00	0.00	0.00	854.15	-471.82	0.05	471.82
16	LAYBARGE	23.36	3.42	0.00	117.94	-0.01	0.00	0.00	851.14	-787.99	0.08	787.99
18	LAYBARGE	8.91	1.61	0.00	146.43	-0.01	0.01	0.00	845.30	-997.79	0.10	997.79
20	LAYBARGE	3.12	0.61	0.00	245.94	-0.02	0.03	0.00	839.82	-1488.74	-0.15	1488.74
24	STINGER	-7.60	-1.71	0.00	104.07	-0.01	0.14	0.00	839.62	-830.23	-0.10	830.23
26	STINGER	-16.46	-3.99	0.00	159.79	0.02	0.47	0.00	838.98	-1134.29	0.14	1134.29
29	STINGER	-26.09	-6.82	0.00	80.75	0.01	0.45	0.00	837.04	-560.67	0.08	560.67
32	STINGER	-34.83	-9.54	0.00	124.41	0.02	0.38	0.00	834.45	-765.13	0.08	765.13
35	STINGER	-44.24	-12.62	0.00	173.57	-0.03	0.36	0.00	830.98	-1097.29	-0.12	1097.29
38	STINGER	-52.83	-15.73	0.00	147.72	0.08	0.07	0.00	827.77	-1119.09	0.15	1119.09
41	STINGER	-61.92	-19.41	0.00	128.49	0.26	0.01	0.00	823.64	-1024.19	0.50	1024.19
43	STINGER	-71.76	-23.95	0.00	135.41	-0.36	0.00	0.00	818.14	-997.05	-1.70	997.05
45	STINGER	-74.57	-25.34	0.00	0.00	0.00	0.54	0.00	817.18	-773.25	-1.34	773.25
47	SAGBEND	-85.31	-30.94	0.00	0.00	0.00	0.00	0.00	811.44	-234.54	-0.66	234.54
48	SAGBEND	-96.07	-36.65	0.00	0.00	0.00	0.00	0.00	804.69	204.88	-0.74	204.88
49	SAGBEND	-106.88	-42.29	0.00	0.00	0.00	0.00	0.00	797.95	299.66	-0.82	299.66
50	SAGBEND	-117.78	-47.78	0.00	0.00	0.00	0.00	0.00	791.50	340.09	-0.77	340.09
51	SAGBEND	-128.76	-53.13	0.00	0.00	0.00	0.00	0.00	785.39	355.05	-0.70	355.05
52	SAGBEND	-139.82	-58.30	0.00	0.00	0.00	0.00	0.00	779.60	373.15	-0.71	373.15
53	SAGBEND	-150.99	-63.22	0.00	0.00	0.00	0.00	0.00	774.05	365.21	0.66	365.21
54	SAGBEND	-162.26	-67.90	0.00	0.00	0.00	0.00	0.00	768.74	372.16	0.66	372.16
55	SAGBEND	-173.62	-72.34	0.00	0.00	0.00	0.00	0.00	763.69	368.27	-0.70	368.27
56	SAGBEND	-185.06	-76.55	0.00	0.00	0.00	0.00	0.00	758.85	377.27	-0.71	377.27
57	SAGBEND	-196.60	-80.52	0.00	0.00	0.00	0.00	0.00	754.23	377.97	-0.69	377.97
58	SAGBEND	-208.21	-84.28	0.00	0.00	0.00	0.00	0.00	749.86	370.81	-0.61	370.81
59	SAGBEND	-219.89	-87.83	0.00	0.00	0.00	0.00	0.00	745.80	378.79	-0.73	378.79
60	SAGBEND	-231.65	-91.07	0.00	0.00	0.00	0.00	0.00	742.49	392.25	-0.87	392.25
61	SAGBEND	-243.48	-94.03	0.00	0.00	0.00	0.00	0.00	739.99	399.29	-0.95	399.29
62	SAGBEND	-255.38	-96.72	0.00	0.00	0.00	0.00	0.00	737.96	395.52	-0.89	395.52
63	SAGBEND	-267.34	-99.14	0.00	0.00	0.00	0.00	0.00	736.30	387.91	-0.67	387.91
64	SAGBEND	-279.35	-101.31	0.00	0.00	0.00	0.00	0.00	734.94	386.41	-0.54	386.41
65	SAGBEND	-291.39	-103.23	0.00	0.00	0.00	0.00	0.00	733.82	375.73	0.50	375.73
66	SAGBEND	-303.48	-104.86	0.00	0.00	0.00	0.00	0.00	732.91	384.51	0.75	384.51
67	SAGBEND	-315.60	-106.23	0.00	0.00	0.00	0.00	0.00	732.26	392.54	0.92	392.54
68	SAGBEND	-327.75	-107.34	0.00	0.00	0.00	0.00	0.00	731.90	407.96	-0.98	407.96
69	SAGBEND	-339.93	-108.15	0.00	0.00	0.00	0.00	0.00	731.89	399.93	-1.01	399.93
70	SAGBEND	-352.11	-108.70	0.00	0.00	0.01	0.00	0.00	732.24	349.25	-0.68	349.25
71	SAGBEND	-364.31	-109.00	0.00	6.28	-0.10	0.00	0.00	732.93	266.63	-0.68	266.63
72	SEABED	-376.51	-109.13	0.00	21.35	0.19	0.00	0.00	733.87	178.47	1.09	178.47
73	SEABED	-388.71	-109.17	0.00	21.79	0.11	0.00	0.00	735.21	78.85	0.69	78.85
74	SEABED	-400.91	-109.17	0.00	18.86	-0.03	0.00	0.00	736.54	13.76	0.23	13.76
75	SEABED	-413.11	-109.17	0.00	16.77	-0.01	0.00	0.00	737.82	-6.02	-0.05	6.02
76	SEABED	-425.31	-109.17	0.00	15.48	-0.01	0.00	0.00	739.07	-2.94	-0.03	2.94
77	SEABED	-437.51	-109.17	0.00	15.17	0.00	0.00	0.00	740.27	-0.77	-0.02	0.77
78	SEABED	-449.71	-109.17	0.00	15.20	0.00	0.00	0.00	741.43	0.35	-0.01	0.35
79	SEABED	-461.91	-109.17	0.00	15.20	0.00	0.00	0.00	742.53	0.13	0.02	0.13
80	SEABED	-474.11	-109.17	0.00	0.00	0.00	0.00	0.00	743.58	0.00	0.00	0.00

Water Depth 109 m (45°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.95	.00	19.62	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	16.39	.00	-7.59	-.01	22.84	5.10
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	16.37	.00	-6.61	.00	21.99	4.91
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	16.34	.00	-21.15	.00	34.32	7.66
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	16.31	.00	-64.73	.00	71.33	15.92
13	LAYBARGE	44.91	4.73	.00	.000	2.151	51.425	16.30	.00	-71.65	.00	77.20	17.23
14	TENSIONR	35.35	4.30	.00	.000	3.173	60.993	32.76	.00	-159.75	-.02	168.55	37.62
16	LAYBARGE	23.34	3.42	.00	.000	5.432	73.039	32.57	.00	-261.45	.00	254.81	56.88
18	LAYBARGE	8.89	1.61	.00	.000	8.938	87.606	32.24	.00	-323.28	.01	307.03	68.53
20	LAYBARGE	3.11	.61	.00	.000	10.762	93.474	32.06	.00	-345.46	-.13	325.70	72.70
24	STINGER	-7.61	-1.71	.00	-.002	13.461	104.441	31.80	-.28	-207.59	-.85	208.40	46.52
26	STINGER	-16.47	-3.97	.00	-.006	15.036	113.586	31.52	-.64	-171.39	-.67	177.52	39.62
29	STINGER	-26.11	-6.68	.00	-.009	16.298	123.601	31.17	-1.07	-110.36	-.55	125.52	28.02
32	STINGER	-34.87	-9.32	.00	-.012	17.316	132.745	30.81	-1.50	-136.63	-.80	147.70	32.97
35	STINGER	-44.29	-12.38	.01	-.010	18.681	142.648	30.40	-1.99	-170.37	.50	176.21	39.33
38	STINGER	-52.90	-15.44	.01	-.025	20.663	151.792	29.92	-2.48	-304.50	-4.33	290.02	64.74
41	STINGER	-62.01	-19.12	.01	.027	23.247	161.621	29.45	-3.07	-273.60	14.09	263.87	58.90
43	STINGER	-71.84	-23.62	.01	-.188	25.930	172.431	28.84	-3.79	-277.49	-54.63	271.15	60.53
45	STINGER	-74.66	-25.01	.03	-.350	26.654	175.574	28.69	-4.02	-208.93	-43.29	212.09	47.34
47	SAGBEND	-85.41	-30.60	.13	-.698	27.986	187.696	27.99	-4.91	-43.77	-14.44	69.76	15.57
48	SAGBEND	-96.18	-36.34	.27	-.790	27.998	199.895	27.22	-5.83	31.84	-1.24	57.45	12.82
49	SAGBEND	-106.98	-42.02	.42	-.762	27.400	212.095	26.46	-6.75	66.73	4.62	86.89	19.40
50	SAGBEND	-117.85	-47.55	.56	-.683	26.518	224.295	25.72	-7.63	83.32	7.11	100.83	22.51
51	SAGBEND	-128.81	-52.90	.68	-.584	25.498	236.495	25.01	-8.49	91.62	8.02	107.68	24.03
52	SAGBEND	-139.87	-58.05	.78	-.480	24.407	248.695	24.32	-9.32	96.11	8.11	111.26	24.83
53	SAGBEND	-151.03	-62.98	.87	-.378	23.275	260.895	23.66	-10.11	98.85	7.80	113.34	25.30
54	SAGBEND	-162.28	-67.69	.93	-.282	22.116	273.095	23.03	-10.87	100.78	7.32	114.74	25.61
55	SAGBEND	-173.63	-72.17	.98	-.194	20.938	285.295	22.43	-11.59	102.33	6.81	115.84	25.86
56	SAGBEND	-185.07	-76.41	1.01	-.113	19.742	297.495	21.87	-12.27	103.70	6.31	116.79	26.07
57	SAGBEND	-196.60	-80.41	1.02	-.038	18.532	309.695	21.33	-12.91	104.97	5.83	117.68	26.27
58	SAGBEND	-208.21	-84.16	1.02	.031	17.307	321.895	20.83	-13.51	106.16	5.39	118.52	26.46
59	SAGBEND	-219.89	-87.67	1.01	.094	16.068	334.095	20.36	-14.07	107.30	5.00	119.33	26.64
60	SAGBEND	-231.65	-90.91	.98	.152	14.817	346.296	19.93	-14.60	108.37	4.64	120.10	26.81
61	SAGBEND	-243.48	-93.90	.95	.206	13.554	358.496	19.53	-15.08	109.38	4.32	120.82	26.97
62	SAGBEND	-255.37	-96.63	.90	.256	12.279	370.696	19.17	-15.51	110.30	4.03	121.49	27.12
63	SAGBEND	-267.32	-99.09	.84	.302	10.995	382.896	18.84	-15.91	111.12	3.77	122.08	27.25
64	SAGBEND	-279.32	-101.28	.77	.345	9.701	395.096	18.55	-16.26	111.81	3.53	122.57	27.36
65	SAGBEND	-291.37	-103.20	.70	.385	8.401	407.296	18.29	-16.57	112.29	3.28	122.90	27.43
66	SAGBEND	-303.46	-104.85	.61	.422	7.097	419.496	18.07	-16.83	112.46	2.99	122.98	27.45
67	SAGBEND	-315.58	-106.22	.52	.455	5.793	431.697	17.89	-17.05	112.04	2.57	122.57	27.36
68	SAGBEND	-327.73	-107.31	.42	.481	4.501	443.897	17.74	-17.23	110.53	1.86	121.24	27.06
69	SAGBEND	-339.90	-108.13	.32	.495	3.237	456.097	17.63	-17.36	106.82	.49	118.07	26.35
70	SAGBEND	-352.09	-108.69	.21	.487	2.039	468.298	17.56	-17.45	98.61	-2.29	111.16	24.81
71	SAGBEND	-364.28	-109.01	.11	.431	.984	480.498	17.52	-17.50	81.10	-8.07	96.74	21.59
72	SEABED	-376.48	-109.13	.03	.279	.230	492.699	17.51	-17.52	44.22	-19.34	68.98	15.40
73	SEABED	-388.68	-109.15	.00	.053	-.019	504.899	17.51	-17.52	4.88	-12.72	40.78	9.10
74	SEABED	-400.88	-109.14	.00	-.010	-.016	517.099	17.51	-17.52	-2.02	-.58	31.90	7.12
75	SEABED	-413.08	-109.14	.00	-.004	-.001	529.299	17.51	-17.52	-.56	.67	30.98	6.92
76	SEABED	-425.28	-109.14	.00	.000	.001	541.499	17.51	-17.52	.05	.12	30.43	6.79
77	SEABED	-437.48	-109.14	.00	.000	.000	553.699	17.51	-17.52	.04	-.03	30.37	6.78
78	SEABED	-449.68	-109.14	.00	.000	.000	565.899	17.51	-17.52	.00	-.01	30.34	6.77
79	SEABED	-461.88	-109.14	.00	.000	.000	578.099	17.51	-17.52	.00	.00	30.34	6.77
80	SEABED	-474.08	-109.14	.00	.000	.000	590.299	17.51	-17.52	.00	.00	30.34	6.77
81	SEABED	-486.28	-109.14	.00	.000	.000	602.499	17.51	-17.52	.00	.00	30.34	6.77
82	SEABED	-498.48	-109.14	.00	.000	.000	614.699	17.51	-17.52	.00	.00	30.34	6.77
83	SEABED	-510.68	-109.14	.00	.000	.000	626.899	17.51	-17.52	.00	.00	30.34	6.77

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.47	.00	.00	.00	-1.36	-77.24	.00	77.24
5	LAYBARGE	73.45	5.65	.00	50.06	.00	.00	.00	-2.64	-67.31	.00	67.31
7	TENSIONR	60.11	5.23	.00	43.31	.06	.00	.00	402.80	-22.26	-.04	22.26
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	402.42	-19.37	.00	19.37
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	401.62	-62.03	.00	62.03
11	LAYBARGE	46.45	4.79	.00	36.92	.00	.00	.00	400.88	-189.82	.00	189.82
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	400.64	-210.10	.00	210.10
14	TENSIONR	35.35	4.30	.00	72.94	.10	.00	.00	805.34	-468.48	-.07	468.48
16	LAYBARGE	23.34	3.42	.00	107.11	.00	.00	.00	800.69	-766.70	.00	766.70
18	LAYBARGE	8.89	1.61	.00	78.45	.07	.00	.00	792.52	-948.01	.02	948.01
20	LAYBARGE	3.11	.61	.00	103.83	-.39	.00	.00	788.04	-1013.07	-.38	1013.07

24	STINGER	-7.61	-1.71	.00	18.95	-1.38	.00	.00	785.28	-608.76	-2.50	608.76
26	STINGER	-16.47	-3.97	.00	37.84	-1.22	.00	.00	782.81	-502.60	-1.96	502.60
29	STINGER	-26.11	-6.68	.00	.00	-1.11	.01	.00	779.86	-323.63	-1.61	323.63
32	STINGER	-34.87	-9.32	.00	26.20	-1.68	.00	.00	776.41	-400.66	-2.34	400.67
35	STINGER	-44.29	-12.38	.01	.00	.75	.03	.00	772.36	-499.60	1.47	499.60
38	STINGER	-52.90	-15.44	.01	96.08	-8.29	.00	.00	767.00	-892.95	-12.70	893.04
41	STINGER	-62.01	-19.12	.01	36.53	22.83	.00	.00	762.85	-802.33	41.32	803.39
43	STINGER	-71.84	-23.62	.01	96.43	-33.60	.00	.00	757.14	-813.74	-160.20	829.36
45	STINGER	-74.66	-25.01	.03	.00	.00	.51	.01	756.25	-612.69	-126.95	625.70
47	SAGBEND	-85.41	-30.60	.13	.00	.00	.00	.00	750.35	-128.37	-42.34	135.17
48	SAGBEND	-96.18	-36.34	.27	.00	.00	.00	.00	743.24	93.38	-3.63	93.45
49	SAGBEND	-106.98	-42.02	.42	.00	.00	.00	.00	736.09	195.69	13.54	196.16
50	SAGBEND	-117.85	-47.55	.56	.00	.00	.00	.00	729.15	244.33	20.84	245.21
51	SAGBEND	-128.81	-52.90	.68	.00	.00	.00	.00	722.45	268.66	23.51	269.69
52	SAGBEND	-139.87	-58.05	.78	.00	.00	.00	.00	716.03	281.85	23.79	282.85
53	SAGBEND	-151.03	-62.98	.87	.00	.00	.00	.00	709.88	289.87	22.86	290.77
54	SAGBEND	-162.28	-67.69	.93	.00	.00	.00	.00	704.02	295.53	21.48	296.31
55	SAGBEND	-173.63	-72.17	.98	.00	.00	.00	.00	698.44	300.09	19.97	300.76
56	SAGBEND	-185.07	-76.41	1.01	.00	.00	.00	.00	693.16	304.11	18.49	304.67
57	SAGBEND	-196.60	-80.41	1.02	.00	.00	.00	.00	688.18	307.82	17.10	308.29
58	SAGBEND	-208.21	-84.16	1.02	.00	.00	.00	.00	683.51	311.33	15.82	311.73
59	SAGBEND	-219.89	-87.67	1.01	.00	.00	.00	.00	679.14	314.65	14.66	315.00
60	SAGBEND	-231.65	-90.91	.98	.00	.00	.00	.00	675.10	317.80	13.61	318.09
61	SAGBEND	-243.48	-93.90	.95	.00	.00	.00	.00	671.37	320.75	12.67	321.00
62	SAGBEND	-255.37	-96.63	.90	.00	.00	.00	.00	667.98	323.45	11.83	323.67
63	SAGBEND	-267.32	-99.09	.84	.00	.00	.00	.00	664.91	325.86	11.07	326.05
64	SAGBEND	-279.32	-101.28	.77	.00	.00	.00	.00	662.18	327.87	10.35	328.03
65	SAGBEND	-291.37	-103.20	.70	.00	.00	.00	.00	659.79	329.30	9.62	329.44
66	SAGBEND	-303.46	-104.85	.61	.00	.00	.00	.00	657.74	329.78	8.77	329.90
67	SAGBEND	-315.58	-106.22	.52	.00	.00	.00	.00	656.04	328.57	7.54	328.66
68	SAGBEND	-327.73	-107.31	.42	.00	.00	.00	.00	654.69	324.13	5.44	324.17
69	SAGBEND	-339.90	-108.13	.32	.00	.00	.00	.00	653.69	313.24	1.43	313.25
70	SAGBEND	-352.09	-108.69	.21	.00	.00	.00	.00	653.03	289.18	-6.72	289.26
71	SAGBEND	-364.28	-109.01	.11	.00	.00	.00	.00	652.71	237.84	-23.67	239.01
72	SEABED	-376.48	-109.13	.03	8.59	-7.02	.00	.00	652.67	129.66	-56.71	141.52
73	SEABED	-388.68	-109.15	.00	22.31	-2.70	.00	.00	652.69	14.31	-37.30	39.95
74	SEABED	-400.88	-109.14	.00	17.29	2.49	.00	.00	652.69	-5.93	-1.71	6.17
75	SEABED	-413.08	-109.14	.00	15.02	.47	.00	.00	652.69	-1.64	1.97	2.56
76	SEABED	-425.28	-109.14	.00	15.03	-.09	.00	.00	652.69	.14	.34	.37
77	SEABED	-437.48	-109.14	.00	15.16	-.04	.00	.00	652.69	.12	-.07	.14
78	SEABED	-449.68	-109.14	.00	15.18	.00	.00	.00	652.69	.01	-.03	.03
79	SEABED	-461.88	-109.14	.00	15.18	.00	.00	.00	652.69	-.01	.00	.01
80	SEABED	-474.08	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
81	SEABED	-486.28	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
82	SEABED	-498.48	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
83	SEABED	-510.68	-109.14	.00	.00	.00	.00	.00	652.69	.00	.00	.00

MAXIMUM DYNAMIC PIPE FORCES AND STRAINS

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.31	6.28	0.00	0.001	1.575	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.28	5.96	0.00	0.001	1.572	12.04	-0.0001	0.0000	-0.0136	-0.0001	0.0137	0.00
5	LAYBARGE	73.45	5.65	0.00	0.001	1.745	22.87	-0.0002	0.0000	-0.0112	0.0000	0.0113	0.00
7	TENSIONR	60.11	5.23	0.00	0.001	1.775	36.22	0.0087	0.0000	-0.0038	0.0000	0.0124	0.00
9	LAYBARGE	57.08	5.14	0.00	0.001	1.808	39.25	0.0087	0.0000	-0.0033	0.0000	0.0119	0.00
10	LAYBARGE	51.09	4.95	0.00	0.001	1.863	45.24	0.0087	0.0000	-0.0105	0.0001	0.0191	0.00
11	LAYBARGE	46.45	4.79	0.00	0.000	2.049	49.89	0.0087	0.0000	-0.0317	-0.0002	0.0402	0.00
13	LAYBARGE	44.91	4.73	0.00	0.000	2.151	51.42	0.0087	0.0000	-0.0350	0.0002	0.0435	0.00
14	TENSIONR	35.36	4.30	0.00	0.000	3.173	60.99	0.0168	0.0000	-0.0778	-0.0006	0.0944	0.00
16	LAYBARGE	23.35	3.41	0.00	-0.001	5.432	73.04	0.0168	0.0000	-0.1297	0.0009	0.1462	0.00
18	LAYBARGE	8.90	1.61	0.00	0.000	8.929	87.61	0.0167	0.0000	-0.1654	-0.0012	0.1816	0.00
20	LAYBARGE	3.11	0.61	0.00	0.000	10.682	93.47	0.0166	0.0000	-0.2873	-0.0023	0.3033	0.00
24	STINGER	-7.63	-1.71	0.00	0.001	13.562	104.44	0.0165	-0.0002	-0.1401	-0.0021	0.1563	0.00
26	STINGER	-16.49	-3.99	0.00	-0.004	15.332	113.58	0.0164	-0.0003	-0.1843	-0.0017	0.2003	0.00
29	STINGER	-26.08	-6.78	0.00	-0.011	16.547	123.60	0.0162	-0.0006	-0.0863	-0.0012	0.1023	0.00
32	STINGER	-34.82	-9.44	0.00	-0.016	17.521	132.75	0.0161	-0.0008	-0.1177	-0.0011	0.1332	0.00
35	STINGER	-44.26	-12.43	0.01	-0.014	18.497	142.66	0.0159	-0.0010	-0.1787	0.0015	0.1943	0.00
38	STINGER	-52.87	-15.50	0.01	-0.030	20.589	151.80	0.0156	-0.0012	-0.1894	-0.0037	0.2039	0.00
41	STINGER	-62.01	-19.20	0.01	0.021	23.180	161.65	0.0154	-0.0015	-0.1878	0.0138	0.2022	0.00
43	STINGER	-71.84	-23.70	0.01	-0.196	26.113	172.45	0.0151	-0.0019	-0.1675	-0.0504	0.1863	0.00
45	STINGER	-74.64	-25.09	0.03	-0.371	26.799	175.59	0.0151	-0.0020	-0.1291	-0.0399	0.1471	0.00
47	SAGBEND	-85.41	-30.70	0.14	-0.764	28.071	187.70	0.0147	-0.0024	-0.0366	-0.0163	0.0527	0.00
48	SAGBEND	-96.16	-36.46	0.29	-0.835	28.096	199.90	0.0144	-0.0029	0.0315	-0.0090	0.0455	0.00
49	SAGBEND	-106.96	-42.14	0.46	-0.803	27.464	212.10	0.0140	-0.0033	0.0483	0.0107	0.0621	0.00
50	SAGBEND	-117.82	-47.68	0.61	-0.734	26.558	224.30	0.0137	-0.0037	0.0562	0.0117	0.0700	0.00
51	SAGBEND	-128.78	-53.04	0.73	-0.643	25.472	236.50	0.0133	-0.0041	0.0592	0.0112	0.0737	0.00
52	SAGBEND	-139.85	-58.20	0.84	-0.521	24.367	248.70	0.0130	-0.0045	0.0611	0.0106	0.0758	0.00
53	SAGBEND	-151.01	-63.15	0.94	-0.407	23.250	260.90	0.0127	-0.0049	0.0609	0.0107	0.0755	0.00
54	SAGBEND	-162.27	-67.86	1.02	-0.331	22.043	273.10	0.0124	-0.0053	0.0598	0.0112	0.0743	0.00
55	SAGBEND	-173.62	-72.31	1.07	-0.232	20.862	285.30	0.0121	-0.0056	0.0610	0.0108	0.0747	0.00
56	SAGBEND	-185.05	-76.57	1.10	-0.120	19.725	297.50	0.0119	-0.0060	0.0619	0.0102	0.0755	0.00
57	SAGBEND	-196.57	-80.57	1.11	-0.048	18.507	309.70	0.0116	-0.0063	0.0621	0.0099	0.0755	0.00
58	SAGBEND	-208.18	-84.32	1.10	0.028	17.253	321.90	0.0114	-0.0066	0.0622	0.0084	0.0756	0.00
59	SAGBEND	-219.86	-87.81	1.09	0.091	15.996	334.10	0.0112	-0.0068	0.0636	0.0068	0.0776	0.00
60	SAGBEND	-231.63	-91.06	1.07	0.149	14.749	346.30	0.0110	-0.0071	0.0641	0.0075	0.0785	0.00
61	SAGBEND	-243.46	-94.04	1.05	0.211	13.471	358.49	0.0108	-0.0073	0.0644	0.0093	0.0786	0.00
62	SAGBEND	-255.35	-96.74	1.00	0.265	12.209	370.69	0.0107	-0.0075	0.0637	0.0104	0.0774	0.00
63	SAGBEND	-267.31	-99.18	0.95	0.318	10.911	382.89	0.0105	-0.0077	0.0628	0.0106	0.0765	0.00

64	SAGBEND	-279.31	-101.37	0.87	0.376	9.614	395.09	0.0104	-0.0079	0.0625	0.0096	0.0759	0.00
65	SAGBEND	-291.36	-103.25	0.78	0.446	8.383	407.29	0.0103	-0.0080	0.0629	0.0085	0.0769	0.00
66	SAGBEND	-303.45	-104.88	0.67	0.502	7.088	419.49	0.0102	-0.0082	0.0632	0.0068	0.0772	0.00
67	SAGBEND	-315.57	-106.26	0.59	0.538	5.762	431.69	0.0101	-0.0083	0.0654	0.0069	0.0788	0.00
68	SAGBEND	-327.72	-107.35	0.48	0.545	4.462	443.89	0.0101	-0.0084	0.0656	0.0071	0.0797	0.00
69	SAGBEND	-339.89	-108.18	0.37	0.552	3.199	456.09	0.0101	-0.0084	0.0628	-0.0081	0.0764	0.00
70	SAGBEND	-352.08	-108.71	0.27	0.554	1.982	468.29	0.0100	-0.0085	0.0558	-0.0089	0.0686	0.00
71	SAGBEND	-364.27	-109.01	0.17	0.484	0.957	480.49	0.0100	-0.0085	0.0443	-0.0114	0.0574	0.00
72	SEABED	-376.47	-109.14	0.08	0.348	0.318	492.69	0.0101	-0.0085	0.0292	-0.0153	0.0432	0.00
73	SEABED	-388.67	-109.17	0.03	0.192	0.032	504.89	0.0101	-0.0085	0.0118	-0.0141	0.0298	0.00
74	SEABED	-400.87	-109.17	0.00	0.048	-0.032	517.09	0.0101	-0.0085	0.0016	-0.0084	0.0218	0.00
75	SEABED	-413.07	-109.17	0.00	-0.008	-0.012	529.29	0.0101	-0.0085	-0.0010	-0.0019	0.0172	0.00
76	SEABED	-425.27	-109.17	0.00	-0.005	-0.002	541.49	0.0101	-0.0085	-0.0005	0.0005	0.0165	0.00
77	SEABED	-437.47	-109.17	0.00	-0.002	0.001	553.69	0.0102	-0.0085	-0.0001	0.0003	0.0163	0.00
78	SEABED	-449.67	-109.17	0.00	0.000	0.000	565.89	0.0102	-0.0085	0.0001	0.0001	0.0162	0.00
79	SEABED	-461.87	-109.17	0.00	0.000	0.000	578.09	0.0102	-0.0085	0.0000	0.0000	0.0162	0.00
80	SEABED	-474.07	-109.17	0.00	0.000	0.000	590.29	0.0102	-0.0085	0.0000	0.0000	0.0162	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	0.00	16.85	-0.17	0.00	0.00	0.00	4.66	0.05	4.66
3	LAYBARGE	84.28	5.96	0.00	57.21	-0.36	0.00	0.00	-4.79	-82.64	-0.33	82.64
5	LAYBARGE	73.45	5.65	0.00	50.81	-0.23	0.00	0.00	-9.17	-68.28	0.20	68.28
7	TENSIONR	60.11	5.23	0.00	44.34	0.47	0.00	0.00	445.22	-22.87	-0.19	22.87
9	LAYBARGE	57.08	5.14	0.00	0.00	0.00	0.00	0.00	445.01	-19.98	0.15	19.98
10	LAYBARGE	51.09	4.95	0.00	0.00	0.00	0.00	0.00	444.85	-63.85	0.73	63.85
11	LAYBARGE	46.45	4.79	0.00	38.46	0.30	0.00	0.00	444.73	-192.28	-1.01	192.28
13	LAYBARGE	44.91	4.73	0.00	0.00	0.00	0.00	0.00	444.69	-212.23	1.32	212.23
14	TENSIONR	35.36	4.30	0.00	76.53	0.37	0.00	0.00	856.70	-472.50	-3.57	472.50
16	LAYBARGE	23.35	3.41	0.00	118.42	0.77	0.00	0.00	853.88	-787.60	5.18	787.60
18	LAYBARGE	8.90	1.61	0.00	153.71	1.94	0.01	0.00	848.03	-1003.87	-7.11	1003.88
20	LAYBARGE	3.11	0.61	0.00	250.73	-3.16	0.03	0.00	843.85	-1497.69	-13.60	1497.70
24	STINGER	-7.63	-1.71	0.00	123.13	-5.67	0.32	0.00	842.56	-850.53	-12.76	850.54
26	STINGER	-16.49	-3.99	0.00	159.68	-4.60	0.93	0.00	841.47	-1118.20	-10.19	1118.20
29	STINGER	-26.08	-6.78	0.00	90.04	-4.30	0.89	0.00	839.57	-524.11	-7.55	524.14
32	STINGER	-34.82	-9.44	0.00	161.91	-4.05	0.42	0.00	836.92	-714.75	-6.91	714.75
35	STINGER	-44.26	-12.43	0.01	178.12	3.55	0.39	0.00	833.07	-1084.30	9.02	1084.30
38	STINGER	-52.87	-15.50	0.01	156.51	-14.43	0.07	0.00	827.63	-1148.37	-22.24	1148.47
41	STINGER	-62.01	-19.20	0.01	148.15	45.47	0.00	0.00	823.87	-1138.62	83.73	1140.28
43	STINGER	-71.84	-23.70	0.01	129.54	-64.10	0.00	0.00	818.18	-1016.72	-305.89	1038.05
45	STINGER	-74.64	-25.09	0.03	0.00	0.00	0.54	0.02	817.67	-783.91	-241.95	800.29
47	SAGBEND	-85.41	-30.70	0.14	0.00	0.00	0.00	0.00	812.53	-222.09	-98.66	226.76
48	SAGBEND	-96.16	-36.46	0.29	0.00	0.00	0.00	0.00	805.82	191.32	-54.76	191.61
49	SAGBEND	-106.96	-42.14	0.46	0.00	0.00	0.00	0.00	799.01	293.17	64.89	293.27
50	SAGBEND	-117.82	-47.68	0.61	0.00	0.00	0.00	0.00	792.43	341.08	71.25	341.18
51	SAGBEND	-128.78	-53.04	0.73	0.00	0.00	0.00	0.00	786.21	359.33	67.77	359.86
52	SAGBEND	-139.85	-58.20	0.84	0.00	0.00	0.00	0.00	780.40	370.78	64.47	370.85
53	SAGBEND	-151.01	-63.15	0.94	0.00	0.00	0.00	0.00	774.99	369.39	65.15	369.45
54	SAGBEND	-162.27	-67.86	1.02	0.00	0.00	0.00	0.00	769.92	363.17	67.81	363.17
55	SAGBEND	-173.62	-72.31	1.07	0.00	0.00	0.00	0.00	765.11	370.24	65.75	370.39
56	SAGBEND	-185.05	-76.57	1.10	0.00	0.00	0.00	0.00	760.51	375.93	62.17	376.96
57	SAGBEND	-196.57	-80.57	1.11	0.00	0.00	0.00	0.00	756.14	377.06	60.03	377.77
58	SAGBEND	-208.18	-84.32	1.10	0.00	0.00	0.00	0.00	752.02	377.44	50.87	377.65
59	SAGBEND	-219.86	-87.81	1.09	0.00	0.00	0.00	0.00	748.23	386.26	41.08	386.29
60	SAGBEND	-231.63	-91.06	1.07	0.00	0.00	0.00	0.00	744.83	389.17	45.82	389.17
61	SAGBEND	-243.46	-94.04	1.05	0.00	0.00	0.00	0.00	741.72	390.79	56.66	390.84
62	SAGBEND	-255.35	-96.74	1.00	0.00	0.00	0.00	0.00	738.89	386.81	63.08	386.97
63	SAGBEND	-267.31	-99.18	0.95	0.00	0.00	0.00	0.00	736.34	381.47	64.58	381.78
64	SAGBEND	-279.31	-101.37	0.87	0.00	0.00	0.00	0.00	734.32	379.61	58.35	379.74
65	SAGBEND	-291.36	-103.25	0.78	0.00	0.00	0.00	0.00	733.01	381.94	51.43	383.02
66	SAGBEND	-303.45	-104.88	0.67	0.00	0.00	0.00	0.00	732.13	383.79	41.10	384.00
67	SAGBEND	-315.57	-106.26	0.59	0.00	0.00	0.00	0.00	731.69	396.79	41.59	396.87
68	SAGBEND	-327.72	-107.35	0.48	0.00	0.00	0.00	0.00	731.63	397.92	42.93	397.95
69	SAGBEND	-339.89	-108.18	0.37	0.00	0.00	0.00	0.00	731.91	381.25	-49.41	381.50
70	SAGBEND	-352.08	-108.71	0.27	0.00	0.00	0.00	0.00	732.48	338.96	-54.21	339.19
71	SAGBEND	-364.27	-109.01	0.17	5.64	-3.59	0.00	0.00	733.31	269.16	-68.93	269.35
72	SEABED	-376.47	-109.14	0.08	20.47	-11.54	0.00	0.00	734.37	177.12	-92.85	182.86
73	SEABED	-388.67	-109.17	0.03	21.43	-11.76	0.00	0.00	735.53	71.85	-85.69	98.95
74	SEABED	-400.87	-109.17	0.00	18.91	-3.97	0.00	0.00	736.64	9.50	-50.71	50.81
75	SEABED	-413.07	-109.17	0.00	16.67	1.92	0.00	0.00	737.71	-6.28	-11.62	12.55
76	SEABED	-425.27	-109.17	0.00	15.35	1.03	0.00	0.00	738.74	-2.84	2.90	3.37
77	SEABED	-437.47	-109.17	0.00	15.18	0.24	0.00	0.00	739.73	-0.72	1.73	1.80
78	SEABED	-449.67	-109.17	0.00	15.20	-0.11	0.00	0.00	740.68	0.33	0.59	0.61
79	SEABED	-461.87	-109.17	0.00	15.21	-0.07	0.00	0.00	741.59	0.14	-0.30	0.30
80	SEABED	-474.07	-109.17	0.00	0.00	-0.01	0.00	0.00	742.44	0.00	0.00	0.00

Water Depth 109 m (90°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.95	.00	19.62	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	16.39	.00	-7.59	-.03	22.84	5.10
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	16.37	.00	-6.61	.00	21.99	4.91
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	16.34	.00	-21.15	.00	34.31	7.66
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	16.31	.00	-64.72	.00	71.32	15.92
13	LAYBARGE	44.91	4.73	.00	.000	2.151	51.425	16.30	.00	-71.64	.00	77.20	17.23
14	TENSIONR	35.35	4.30	.00	.000	3.173	60.993	32.76	.00	-159.78	-.04	168.58	37.63
16	LAYBARGE	23.34	3.42	.00	.000	5.431	73.039	32.57	.00	-261.29	.00	254.67	56.85
18	LAYBARGE	8.89	1.61	.00	.000	8.940	87.606	32.24	.00	-323.91	.01	307.56	68.65
20	LAYBARGE	3.11	.61	.00	-.001	10.756	93.474	32.06	.00	-341.44	-.26	322.29	71.94
24	STINGER	-7.58	-1.70	.00	-.004	13.401	104.411	31.81	-.27	-202.12	-1.61	203.75	45.48
26	STINGER	-16.45	-3.95	.00	-.011	14.993	113.555	31.52	-.63	-180.93	-1.27	185.63	41.43
29	STINGER	-26.11	-6.67	.00	-.016	16.382	123.594	31.17	-1.07	-127.46	-1.05	140.05	31.26
32	STINGER	-34.85	-9.34	.01	-.022	17.598	132.738	30.80	-1.50	-166.41	-1.50	173.01	38.62
35	STINGER	-44.27	-12.46	.01	-.019	19.127	142.662	30.38	-2.00	-175.60	.89	180.65	40.32
38	STINGER	-52.86	-15.59	.01	-.046	21.062	151.806	29.91	-2.50	-288.12	-7.98	276.17	61.64
41	STINGER	-61.97	-19.33	.02	.049	23.523	161.646	29.43	-3.10	-262.00	26.02	254.79	56.87
43	STINGER	-71.78	-23.85	.02	-.350	25.988	172.454	28.82	-3.83	-244.45	-101.36	255.69	57.07
45	STINGER	-74.59	-25.25	.05	-.650	26.623	175.591	28.67	-4.05	-182.68	-80.38	200.37	44.73
47	SAGBEND	-85.34	-30.80	.24	-1.299	27.761	187.696	27.96	-4.95	-34.33	-27.25	67.83	15.14
48	SAGBEND	-96.13	-36.49	.51	-1.476	27.713	199.896	27.20	-5.86	33.78	-2.92	59.17	13.21
49	SAGBEND	-106.95	-42.12	.79	-1.433	27.115	212.095	26.45	-6.76	65.37	7.93	86.00	19.20
50	SAGBEND	-117.85	-47.60	1.05	-1.295	26.258	224.295	25.72	-7.64	80.59	12.63	99.10	22.12
51	SAGBEND	-128.83	-52.90	1.28	-1.118	25.273	236.495	25.01	-8.49	88.43	14.45	105.67	23.59
52	SAGBEND	-139.91	-58.01	1.47	-.929	24.219	248.695	24.33	-9.31	92.91	14.77	109.24	24.38
53	SAGBEND	-151.08	-62.91	1.64	-.743	23.123	260.895	23.67	-10.10	95.84	14.33	111.44	24.87
54	SAGBEND	-162.35	-67.59	1.77	-.567	21.998	273.095	23.05	-10.85	98.05	13.59	113.00	25.22
55	SAGBEND	-173.70	-72.05	1.86	-.402	20.849	285.295	22.45	-11.57	99.90	12.75	114.28	25.51
56	SAGBEND	-185.15	-76.27	1.93	-.249	19.680	297.495	21.89	-12.25	101.55	11.91	115.41	25.76
57	SAGBEND	-196.68	-80.26	1.96	-.108	18.493	309.695	21.35	-12.89	103.08	11.10	116.46	25.99
58	SAGBEND	-208.29	-84.01	1.97	.024	17.289	321.895	20.85	-13.49	104.51	10.36	117.45	26.22
59	SAGBEND	-219.97	-87.51	1.95	.145	16.068	334.096	20.39	-14.05	105.86	9.67	118.40	26.43
60	SAGBEND	-231.73	-90.76	1.91	.258	14.833	346.296	19.95	-14.57	107.13	9.04	119.29	26.63
61	SAGBEND	-243.56	-93.76	1.85	.363	13.583	358.496	19.55	-15.05	108.31	8.48	120.13	26.81
62	SAGBEND	-255.45	-96.49	1.76	.461	12.320	370.696	19.19	-15.49	109.38	7.97	120.90	26.99
63	SAGBEND	-267.40	-98.96	1.66	.553	11.045	382.896	18.86	-15.89	110.34	7.51	121.59	27.14
64	SAGBEND	-279.39	-101.16	1.53	.639	9.760	395.096	18.56	-16.24	111.16	7.07	122.17	27.27
65	SAGBEND	-291.44	-103.10	1.39	.720	8.467	407.296	18.30	-16.55	111.76	6.63	122.59	27.36
66	SAGBEND	-303.52	-104.76	1.23	.795	7.168	419.496	18.08	-16.82	112.05	6.12	122.74	27.40
67	SAGBEND	-315.64	-106.14	1.05	.862	5.868	431.697	17.90	-17.04	111.77	5.40	122.43	27.33
68	SAGBEND	-327.79	-107.25	.86	.919	4.578	443.897	17.75	-17.22	110.43	4.19	121.21	27.06
69	SAGBEND	-339.96	-108.09	.66	.956	3.314	456.097	17.64	-17.35	106.98	1.90	118.22	26.39
70	SAGBEND	-352.15	-108.67	.46	.954	2.112	468.298	17.56	-17.45	99.24	-2.73	111.69	24.93
71	SAGBEND	-364.34	-109.00	.26	.874	1.045	480.498	17.52	-17.50	82.61	-12.35	98.44	21.97
72	SEABED	-376.54	-109.13	.10	.634	.265	492.699	17.51	-17.52	47.48	-30.79	75.90	16.94
73	SEABED	-388.74	-109.15	.01	.201	-.015	504.899	17.51	-17.52	6.24	-33.68	57.43	12.82
74	SEABED	-400.94	-109.14	.00	-.007	-.018	517.099	17.51	-17.52	-2.04	-5.03	34.41	7.68
75	SEABED	-413.14	-109.14	.00	-.013	-.001	529.299	17.51	-17.52	-.64	1.36	31.45	7.02
76	SEABED	-425.34	-109.14	.00	-.001	.001	541.499	17.51	-17.52	.04	.46	30.68	6.85
77	SEABED	-437.54	-109.14	.00	.001	.000	553.699	17.51	-17.52	.04	-.02	30.37	6.78
78	SEABED	-449.74	-109.14	.00	.000	.000	565.899	17.51	-17.52	.00	-.03	30.36	6.78
79	SEABED	-461.94	-109.14	.00	.000	.000	578.099	17.51	-17.52	.00	.00	30.34	6.77
80	SEABED	-474.14	-109.14	.00	.000	.000	590.299	17.51	-17.52	.00	.00	30.34	6.77
81	SEABED	-486.34	-109.14	.00	.000	.000	602.499	17.51	-17.52	.00	.00	30.34	6.77
82	SEABED	-498.54	-109.14	.00	.000	.000	614.699	17.51	-17.52	.00	.00	30.34	6.77
83	SEABED	-510.74	-109.14	.00	.000	.000	626.899	17.51	-17.52	.00	.00	30.34	6.77

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	HORIZ (KN)	SUPT SEPARATIONS VERT (M)	HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	HORIZ (KN-M)	TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.47	.00	.00	.00	-1.36	-77.24	.00	77.24
5	LAYBARGE	73.45	5.65	.00	50.06	.00	.00	.00	-2.64	-67.31	.00	67.31
7	TENSIONR	60.11	5.23	.00	43.32	.11	.00	.00	402.81	-22.26	-.08	22.26
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	402.43	-19.37	.00	19.37
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	401.63	-62.01	.00	62.01
11	LAYBARGE	46.45	4.79	.00	36.90	.00	.00	.00	400.88	-189.79	.00	189.79
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	400.64	-210.09	.00	210.09
14	TENSIONR	35.35	4.30	.00	73.01	.18	.00	.00	805.34	-468.56	-.13	468.56
16	LAYBARGE	23.34	3.42	.00	106.89	.00	.00	.00	800.69	-766.24	-.01	766.24
18	LAYBARGE	8.89	1.61	.00	80.96	.14	.00	.00	792.52	-949.86	.04	949.86
20	LAYBARGE	3.11	.61	.00	101.42	-.77	.00	.00	788.12	-1001.27	-.75	1001.27

24	STINGER	-7.58	-1.70	.00	12.97	-2.66	.00	.00	785.36	-592.70	-4.71	592.72
26	STINGER	-16.45	-3.95	.00	41.17	-2.36	.00	.00	782.76	-530.57	-3.72	530.58
29	STINGER	-26.11	-6.67	.00	.00	-2.15	.02	.00	779.78	-373.77	-3.07	373.78
32	STINGER	-34.85	-9.34	.01	40.06	-3.17	.00	.00	776.18	-487.98	-4.39	488.00
35	STINGER	-44.27	-12.46	.01	.00	1.30	.02	.00	772.22	-514.94	2.62	514.95
38	STINGER	-52.86	-15.59	.01	85.84	-15.32	.00	.00	767.05	-844.91	-23.39	845.23
41	STINGER	-61.97	-19.33	.02	41.23	42.28	.00	.00	762.74	-768.31	76.31	772.09
43	STINGER	-71.78	-23.85	.02	81.45	-62.21	.00	.00	757.09	-716.83	-297.23	776.02
45	STINGER	-74.59	-25.25	.05	.00	.00	.52	.02	756.10	-535.70	-235.73	585.27
47	SAGBEND	-85.34	-30.80	.24	.00	.00	.00	.00	750.11	-100.67	-79.92	128.54
48	SAGBEND	-96.13	-36.49	.51	.00	.00	.00	.00	743.05	99.05	-8.56	99.42
49	SAGBEND	-106.95	-42.12	.79	.00	.00	.00	.00	735.98	191.69	23.26	193.10
50	SAGBEND	-117.85	-47.60	1.05	.00	.00	.00	.00	729.11	236.32	37.04	239.21
51	SAGBEND	-128.83	-52.90	1.28	.00	.00	.00	.00	722.47	259.31	42.36	262.74
52	SAGBEND	-139.91	-58.01	1.47	.00	.00	.00	.00	716.10	272.45	43.31	275.87
53	SAGBEND	-151.08	-62.91	1.64	.00	.00	.00	.00	710.00	281.06	42.02	284.19
54	SAGBEND	-162.35	-67.59	1.77	.00	.00	.00	.00	704.16	287.54	39.84	290.29
55	SAGBEND	-173.70	-72.05	1.86	.00	.00	.00	.00	698.61	292.96	37.38	295.33
56	SAGBEND	-185.15	-76.27	1.93	.00	.00	.00	.00	693.35	297.80	34.92	299.84
57	SAGBEND	-196.68	-80.26	1.96	.00	.00	.00	.00	688.38	302.28	32.56	304.03
58	SAGBEND	-208.29	-84.01	1.97	.00	.00	.00	.00	683.71	306.49	30.37	307.99
59	SAGBEND	-219.97	-87.51	1.95	.00	.00	.00	.00	679.35	310.44	28.36	311.74
60	SAGBEND	-231.73	-90.76	1.91	.00	.00	.00	.00	675.30	314.15	26.52	315.27
61	SAGBEND	-243.56	-93.76	1.85	.00	.00	.00	.00	671.57	317.60	24.87	318.58
62	SAGBEND	-255.45	-96.49	1.76	.00	.00	.00	.00	668.16	320.76	23.37	321.61
63	SAGBEND	-267.40	-98.96	1.66	.00	.00	.00	.00	665.08	323.58	22.01	324.33
64	SAGBEND	-279.39	-101.16	1.53	.00	.00	.00	.00	662.34	325.97	20.73	326.62
65	SAGBEND	-291.44	-103.10	1.39	.00	.00	.00	.00	659.93	327.75	19.44	328.33
66	SAGBEND	-303.52	-104.76	1.23	.00	.00	.00	.00	657.87	328.59	17.94	329.07
67	SAGBEND	-315.64	-106.14	1.05	.00	.00	.00	.00	656.15	327.77	15.84	328.15
68	SAGBEND	-327.79	-107.25	.86	.00	.00	.00	.00	654.77	323.83	12.29	324.07
69	SAGBEND	-339.96	-108.09	.66	.00	.00	.00	.00	653.75	313.72	5.57	313.76
70	SAGBEND	-352.15	-108.67	.46	.00	.00	.00	.00	653.07	291.01	-8.01	291.12
71	SAGBEND	-364.34	-109.00	.26	.00	.00	.00	.00	652.73	242.26	-36.23	244.95
72	SEABED	-376.54	-109.13	.10	7.26	-7.42	.00	.00	652.65	139.23	-90.30	165.95
73	SEABED	-388.74	-109.15	.01	22.32	-12.23	.00	.00	652.67	18.30	-98.78	100.46
74	SEABED	-400.94	-109.14	.00	17.60	4.80	.00	.00	652.69	-5.99	-14.75	15.92
75	SEABED	-413.14	-109.14	.00	15.06	1.80	.00	.00	652.69	-1.88	3.98	4.40
76	SEABED	-425.34	-109.14	.00	15.01	-.06	.00	.00	652.69	.11	1.34	1.35
77	SEABED	-437.54	-109.14	.00	15.16	-.11	.00	.00	652.69	.13	-.07	.15
78	SEABED	-449.74	-109.14	.00	15.18	-.01	.00	.00	652.69	.01	-.09	.09
79	SEABED	-461.94	-109.14	.00	15.18	.01	.00	.00	652.69	-.01	-.01	.01
80	SEABED	-474.14	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
81	SEABED	-486.34	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
82	SEABED	-498.54	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
83	SEABED	-510.74	-109.14	.00	.00	.00	.00	.00	652.69	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.32	6.29	0.00	0.000	1.578	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.28	5.97	0.00	0.000	1.574	12.04	-0.0001	0.0000	-0.0137	0.0002	0.0137	0.00
5	LAYBARGE	73.45	5.65	0.00	0.000	1.747	22.87	-0.0002	0.0000	-0.0112	0.0002	0.0113	0.00
7	TENSIONR	60.11	5.24	0.00	0.000	1.777	36.22	0.0087	0.0000	-0.0038	-0.0002	0.0124	0.00
9	LAYBARGE	57.08	5.14	0.00	0.000	1.810	39.25	0.0087	0.0000	-0.0033	0.0000	0.0119	0.00
10	LAYBARGE	51.09	4.95	0.00	0.000	1.865	45.24	0.0087	0.0000	-0.0105	0.0003	0.0191	0.00
11	LAYBARGE	46.45	4.79	0.00	0.000	2.050	49.89	0.0087	0.0000	-0.0319	0.0003	0.0404	0.00
13	LAYBARGE	44.91	4.73	0.00	0.000	2.152	51.42	0.0087	0.0000	-0.0350	0.0003	0.0435	0.00
14	TENSIONR	35.36	4.30	0.00	0.000	3.166	60.99	0.0168	0.0000	-0.0778	-0.0009	0.0945	0.00
16	LAYBARGE	23.35	3.42	0.00	0.000	5.431	73.04	0.0167	0.0000	-0.1340	0.0015	0.1504	0.00
18	LAYBARGE	8.89	1.61	0.00	0.000	8.853	87.61	0.0166	0.0000	-0.1655	-0.0026	0.1819	0.00
20	LAYBARGE	3.11	0.61	0.00	-0.004	10.570	93.47	0.0165	0.0000	-0.2880	0.0038	0.3030	0.00
24	STINGER	-7.62	-1.68	0.01	-0.007	13.342	104.44	0.0164	-0.0002	-0.1313	-0.0047	0.1468	0.00
26	STINGER	-16.48	-3.91	0.00	-0.014	15.018	113.58	0.0163	-0.0003	-0.1869	-0.0022	0.2024	0.00
29	STINGER	-26.11	-6.68	0.00	-0.015	16.462	123.61	0.0161	-0.0006	-0.1304	-0.0020	0.1448	0.00
32	STINGER	-34.86	-9.33	0.00	-0.018	17.677	132.75	0.0160	-0.0008	-0.1545	-0.0020	0.1692	0.00
35	STINGER	-44.28	-12.45	0.01	-0.013	19.232	142.67	0.0158	-0.0010	-0.1903	0.0024	0.2047	0.00
38	STINGER	-52.87	-15.59	0.01	-0.043	21.210	151.81	0.0156	-0.0012	-0.1857	-0.0057	0.2001	0.00
41	STINGER	-61.94	-19.32	0.02	0.054	23.650	161.65	0.0153	-0.0015	-0.1716	0.0213	0.1866	0.00
43	STINGER	-71.77	-23.88	0.02	-0.370	26.230	172.46	0.0150	-0.0019	-0.1643	-0.0777	0.1883	0.00
45	STINGER	-74.57	-25.28	0.05	-0.692	26.867	175.58	0.0150	-0.0020	-0.1275	-0.0622	0.1490	0.00
47	SAGBEND	-85.35	-30.88	0.26	-1.410	27.984	187.70	0.0147	-0.0024	-0.0391	-0.0249	0.0559	0.00
48	SAGBEND	-96.14	-36.60	0.54	-1.604	27.914	199.90	0.0143	-0.0029	0.0376	-0.0111	0.0518	0.00
49	SAGBEND	-106.96	-42.26	0.84	-1.517	27.251	212.10	0.0139	-0.0033	0.0509	0.0127	0.0658	0.00
50	SAGBEND	-117.85	-47.75	1.13	-1.367	26.359	224.30	0.0136	-0.0037	0.0577	0.0153	0.0726	0.00
51	SAGBEND	-128.83	-53.05	1.38	-1.224	25.336	236.50	0.0132	-0.0041	0.0600	0.0164	0.0750	0.00
52	SAGBEND	-139.90	-58.16	1.58	-1.004	24.271	248.70	0.0129	-0.0045	0.0623	0.0152	0.0774	0.00
53	SAGBEND	-151.07	-63.06	1.75	-0.788	23.185	260.90	0.0126	-0.0049	0.0638	0.0146	0.0788	0.00
54	SAGBEND	-162.33	-67.74	1.89	-0.615	22.038	273.10	0.0124	-0.0053	0.0637	0.0141	0.0785	0.00
55	SAGBEND	-173.69	-72.23	1.99	-0.477	20.841	285.30	0.0121	-0.0056	0.0625	0.0134	0.0768	0.00
56	SAGBEND	-185.12	-76.49	2.05	-0.299	19.657	297.50	0.0118	-0.0060	0.0634	0.0123	0.0775	0.00
57	SAGBEND	-196.65	-80.50	2.11	-0.102	18.504	309.70	0.0116	-0.0063	0.0639	0.0130	0.0769	0.00
58	SAGBEND	-208.27	-84.24	2.12	0.035	17.292	321.90	0.0113	-0.0066	0.0643	0.0127	0.0773	0.00
59	SAGBEND	-219.96	-87.72	2.11	0.133	16.013	334.10	0.0111	-0.0068	0.0640	0.0109	0.0770	0.00
60	SAGBEND	-231.71	-90.96	2.05	0.264	14.730	346.30	0.0109	-0.0071	0.0654	0.0094	0.0783	0.00
61	SAGBEND	-243.54	-93.94	1.97	0.391	13.490	358.49	0.0107	-0.0073	0.0661	0.0085	0.0788	0.00
62	SAGBEND	-255.43	-96.69	1.89	0.445	12.223	370.69	0.0106	-0.0075	0.0648	0.0093	0.0774	0.00
63	SAGBEND	-267.38	-99.17	1.78	0.504	10.892	382.89	0.0104	-0.0077	0.0627	0.0101	0.0761	0.00

64	SAGBEND	-279.38	-101.34	1.66	0.61	19.615	395.09	0.0103	-0.0079	0.0628	0.0129	0.0769	0.00
65	SAGBEND	-291.42	-103.21	1.52	0.746	8.373	407.29	0.0102	-0.0080	0.0630	0.0138	0.0772	0.00
66	SAGBEND	-303.51	-104.82	1.35	0.855	7.105	419.49	0.0101	-0.0082	0.0618	0.0119	0.0758	0.00
67	SAGBEND	-315.64	-106.19	1.16	0.952	5.752	431.69	0.0100	-0.0083	0.0641	0.0101	0.0779	0.00
68	SAGBEND	-327.79	-107.31	0.94	1.030	4.460	443.89	0.0100	-0.0084	0.0660	0.0084	0.0801	0.00
69	SAGBEND	-339.96	-108.16	0.74	1.056	3.308	456.09	0.0099	-0.0084	0.0642	0.0079	0.0781	0.00
70	SAGBEND	-352.14	-108.72	0.54	1.045	2.035	468.29	0.0099	-0.0085	0.0553	-0.0104	0.0692	0.00
71	SAGBEND	-364.33	-109.03	0.34	0.958	0.941	480.49	0.0099	-0.0085	0.0444	-0.0170	0.0570	0.00
72	SEABED	-376.53	-109.15	0.16	0.692	0.281	492.69	0.0099	-0.0085	0.0289	-0.0231	0.0433	0.00
73	SEABED	-388.73	-109.17	0.05	0.356	0.017	504.89	0.0099	-0.0085	0.0102	-0.0193	0.0334	0.00
74	SEABED	-400.93	-109.17	0.00	0.105	-0.031	517.09	0.0099	-0.0085	-0.0014	-0.0138	0.0275	0.00
75	SEABED	-413.13	-109.17	0.00	-0.003	-0.011	529.29	0.0100	-0.0085	-0.0010	-0.0042	0.0190	0.00
76	SEABED	-425.33	-109.17	0.00	-0.010	-0.002	541.49	0.0100	-0.0085	-0.0004	0.0007	0.0164	0.00
77	SEABED	-437.53	-109.17	0.00	-0.004	0.001	553.69	0.0100	-0.0085	-0.0001	0.0004	0.0163	0.00
78	SEABED	-449.73	-109.17	0.00	0.000	0.000	565.89	0.0100	-0.0085	0.0001	0.0002	0.0161	0.00
79	SEABED	-461.93	-109.17	0.00	0.000	0.000	578.09	0.0100	-0.0085	0.0000	-0.0001	0.0160	0.00
80	SEABED	-474.13	-109.17	0.00	0.000	0.000	590.29	0.0100	-0.0085	0.0000	0.0000	0.0160	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	HORIZ (KN)	SUPT SEPARATIONS VERT (M)	HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	HORIZ (KN-M)	TOTAL (KN-M)
1	LAYBARGE	96.32	6.29	0.00	16.98	0.71	0.00	0.00	0.00	4.69	-0.20	4.69
3	LAYBARGE	84.28	5.97	0.00	57.53	1.79	0.00	0.00	-4.11	-83.06	1.29	83.06
5	LAYBARGE	73.45	5.65	0.00	50.99	1.57	0.00	0.00	-7.88	-68.16	0.99	68.16
7	TENSIONR	60.11	5.24	0.00	44.53	2.05	0.00	0.00	443.96	-23.02	-0.94	23.02
9	LAYBARGE	57.08	5.14	0.00	0.00	0.00	0.00	0.00	443.63	-19.89	-0.22	19.89
10	LAYBARGE	51.09	4.95	0.00	0.00	0.00	0.00	0.00	442.92	-64.01	1.53	64.01
11	LAYBARGE	46.45	4.79	0.00	39.58	1.73	0.00	0.00	442.21	-193.69	1.72	193.69
13	LAYBARGE	44.91	4.73	0.00	0.00	0.00	0.00	0.00	441.98	-212.67	1.95	212.67
14	TENSIONR	35.36	4.30	0.00	76.64	1.35	0.00	0.00	853.76	-472.49	-5.31	472.49
16	LAYBARGE	23.35	3.42	0.00	131.13	1.86	0.00	0.00	850.58	-813.49	9.18	813.49
18	LAYBARGE	8.89	1.61	0.00	153.98	-8.47	0.01	0.00	844.16	-1004.25	-15.65	1004.25
20	LAYBARGE	3.11	0.61	0.00	244.83	-9.43	0.05	0.00	840.06	-1498.65	23.20	1498.65
24	STINGER	-7.62	-1.68	0.01	84.72	-20.92	0.16	0.00	838.15	-797.29	-28.38	797.29
26	STINGER	-16.48	-3.91	0.00	168.22	-7.62	0.49	0.00	836.85	-1133.58	-13.59	1133.61
29	STINGER	-26.11	-6.68	0.00	75.58	-7.18	0.47	0.00	834.85	-791.40	-12.25	791.41
32	STINGER	-34.86	-9.33	0.00	136.37	-6.25	0.22	0.00	831.94	-937.74	-12.36	937.79
35	STINGER	-44.28	-12.45	0.01	151.80	6.06	0.20	0.00	828.41	-1153.83	14.61	1153.83
38	STINGER	-52.87	-15.59	0.01	133.48	-22.64	0.01	0.00	823.42	-1126.33	-34.84	1126.59
41	STINGER	-61.94	-19.32	0.02	118.50	70.29	0.01	0.00	819.84	-1041.36	129.45	1042.76
43	STINGER	-71.77	-23.88	0.02	130.75	-97.41	0.00	0.00	814.29	-996.88	-471.52	1049.04
45	STINGER	-74.57	-25.28	0.05	0.00	0.00	0.55	0.04	813.76	-774.18	-377.69	816.16
47	SAGBEND	-85.35	-30.88	0.26	0.00	0.00	0.00	0.00	808.64	-237.10	-150.91	250.01
48	SAGBEND	-96.14	-36.60	0.54	0.00	0.00	0.00	0.00	801.99	228.31	-67.17	228.45
49	SAGBEND	-106.96	-42.26	0.84	0.00	0.00	0.00	0.00	795.26	308.81	76.90	309.61
50	SAGBEND	-117.85	-47.75	1.13	0.00	0.00	0.00	0.00	788.79	350.04	93.00	351.37
51	SAGBEND	-128.83	-53.05	1.38	0.00	0.00	0.00	0.00	782.72	364.40	99.56	366.82
52	SAGBEND	-139.90	-58.16	1.58	0.00	0.00	0.00	0.00	777.08	378.09	92.19	380.52
53	SAGBEND	-151.07	-63.06	1.75	0.00	0.00	0.00	0.00	771.79	387.19	88.49	389.48
54	SAGBEND	-162.33	-67.74	1.89	0.00	0.00	0.00	0.00	766.74	386.62	85.70	387.96
55	SAGBEND	-173.69	-72.23	1.99	0.00	0.00	0.00	0.00	761.87	379.21	81.18	379.85
56	SAGBEND	-185.12	-76.49	2.05	0.00	0.00	0.00	0.00	757.16	384.88	74.75	385.74
57	SAGBEND	-196.65	-80.50	2.11	0.00	0.00	0.00	0.00	752.65	387.64	79.17	388.20
58	SAGBEND	-208.27	-84.24	2.12	0.00	0.00	0.00	0.00	748.41	390.06	77.18	391.31
59	SAGBEND	-219.96	-87.72	2.11	0.00	0.00	0.00	0.00	744.51	388.25	66.29	388.76
60	SAGBEND	-231.71	-90.96	2.05	0.00	0.00	0.00	0.00	740.91	396.95	56.90	398.19
61	SAGBEND	-243.54	-93.94	1.97	0.00	0.00	0.00	0.00	737.57	401.14	51.66	401.51
62	SAGBEND	-255.43	-96.69	1.89	0.00	0.00	0.00	0.00	734.46	393.08	56.50	393.35
63	SAGBEND	-267.38	-99.17	1.78	0.00	0.00	0.00	0.00	731.59	380.73	61.43	382.24
64	SAGBEND	-279.38	-101.34	1.66	0.00	0.00	0.00	0.00	729.04	381.16	78.29	383.33
65	SAGBEND	-291.42	-103.21	1.52	0.00	0.00	0.00	0.00	727.10	382.24	83.73	382.56
66	SAGBEND	-303.51	-104.82	1.35	0.00	0.00	0.00	0.00	726.09	375.31	72.38	381.14
67	SAGBEND	-315.64	-106.19	1.16	0.00	0.00	0.00	0.00	725.48	388.93	61.26	392.96
68	SAGBEND	-327.79	-107.31	0.94	0.00	0.00	0.00	0.00	725.21	400.70	51.10	402.67
69	SAGBEND	-339.96	-108.16	0.74	0.00	0.00	0.00	0.00	725.24	389.89	47.81	391.06
70	SAGBEND	-352.14	-108.72	0.54	0.00	0.00	0.00	0.00	725.51	335.95	-63.18	336.51
71	SAGBEND	-364.33	-109.03	0.34	5.90	-3.99	0.00	0.00	726.00	269.44	-103.11	269.45
72	SEABED	-376.53	-109.15	0.16	21.13	-14.02	0.00	0.00	726.71	175.70	-140.18	186.05
73	SEABED	-388.73	-109.17	0.05	21.04	-13.43	0.00	0.00	727.55	61.90	-117.34	120.83
74	SEABED	-400.93	-109.17	0.00	19.00	-7.92	0.00	0.00	728.36	-8.45	-83.47	83.47
75	SEABED	-413.13	-109.17	0.00	16.46	2.86	0.00	0.00	729.14	-6.31	-25.28	25.78
76	SEABED	-425.33	-109.17	0.00	15.34	1.72	0.00	0.00	729.89	-2.66	4.38	4.42
77	SEABED	-437.53	-109.17	0.00	15.18	0.50	0.00	0.00	730.61	-0.54	2.68	2.68
78	SEABED	-449.73	-109.17	0.00	15.20	-0.14	0.00	0.00	731.30	0.31	1.12	1.14
79	SEABED	-461.93	-109.17	0.00	15.21	-0.11	0.00	0.00	731.96	0.13	-0.38	0.38
80	SEABED	-474.13	-109.17	0.00	0.00	-0.02	0.00	0.00	732.59	0.00	0.00	0.00

Water Depth 109 (135')

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.96	.00	19.62	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	16.39	.00	-7.58	-.02	22.83	5.10
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	16.37	.00	-6.61	.00	21.99	4.91
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	16.34	.00	-21.19	.00	34.35	7.67
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	16.31	.00	-64.79	.00	71.38	15.93
13	LAYBARGE	44.91	4.73	.00	.000	2.151	51.425	16.30	.00	-71.67	.00	77.22	17.24
14	TENSIONR	35.35	4.30	.00	.000	3.172	60.993	32.76	.00	-159.55	-.03	168.38	37.59
16	LAYBARGE	23.34	3.42	.00	.000	5.436	73.039	32.57	.00	-262.52	.00	255.72	57.08
18	LAYBARGE	8.89	1.61	.00	.000	8.921	87.606	32.24	.00	-318.98	.01	303.38	67.72
20	LAYBARGE	3.11	.61	.00	.000	10.810	93.474	32.04	.00	-373.00	-.13	349.09	77.92
24	STINGER	-7.61	-1.75	.00	-.002	13.722	104.446	31.79	-.28	-222.01	-.85	220.65	49.25
26	STINGER	-16.46	-4.05	.00	-.006	15.420	113.590	31.50	-.65	-185.88	-.67	189.83	42.37
29	STINGER	-26.08	-6.84	.00	-.009	16.766	123.605	31.15	-1.10	-113.63	-.55	128.29	28.64
32	STINGER	-34.81	-9.55	.00	-.012	17.766	132.749	30.79	-1.53	-128.80	-.80	141.04	31.48
35	STINGER	-44.19	-12.66	.01	-.010	19.010	142.632	30.36	-2.03	-151.68	.51	160.32	35.79
38	STINGER	-52.79	-15.76	.01	-.025	20.752	151.776	29.90	-2.53	-266.07	-4.32	257.37	57.45
41	STINGER	-61.91	-19.43	.01	.026	23.009	161.604	29.43	-3.12	-239.42	14.00	234.86	52.42
43	STINGER	-71.77	-23.86	.01	-.185	25.434	172.414	28.82	-3.83	-258.72	-54.06	255.43	57.01
45	STINGER	-74.60	-25.23	.03	-.345	26.111	175.560	28.67	-4.05	-195.16	-42.84	200.56	44.77
47	SAGBEND	-85.42	-30.71	.13	-.689	27.363	187.696	27.97	-4.93	-41.96	-14.43	68.29	15.24
48	SAGBEND	-96.25	-36.34	.27	-.782	27.390	199.896	27.23	-5.83	28.19	-1.47	54.37	12.14
49	SAGBEND	-107.10	-41.90	.42	-.758	26.850	212.095	26.48	-6.73	60.77	4.30	81.83	18.27
50	SAGBEND	-118.02	-47.34	.56	-.684	26.043	224.295	25.75	-7.60	76.51	6.79	95.07	21.22
51	SAGBEND	-129.03	-52.61	.68	-.589	25.103	236.495	25.05	-8.45	84.70	7.74	101.83	22.73
52	SAGBEND	-140.12	-57.69	.78	-.488	24.091	248.695	24.37	-9.26	89.49	7.90	105.67	23.59
53	SAGBEND	-151.30	-62.56	.87	-.389	23.033	260.895	23.72	-10.04	92.75	7.65	108.19	24.15
54	SAGBEND	-162.57	-67.23	.94	-.295	21.942	273.095	23.09	-10.79	95.27	7.23	110.10	24.58
55	SAGBEND	-173.93	-71.68	.98	-.208	20.824	285.295	22.50	-11.51	97.41	6.77	111.69	24.93
56	SAGBEND	-185.38	-75.90	1.02	-.127	19.682	297.495	21.94	-12.19	99.33	6.30	113.12	25.25
57	SAGBEND	-196.91	-79.89	1.04	-.052	18.519	309.695	21.40	-12.83	101.10	5.86	114.44	25.54
58	SAGBEND	-208.51	-83.65	1.04	.017	17.336	321.896	20.90	-13.43	102.77	5.45	115.68	25.82
59	SAGBEND	-220.20	-87.16	1.03	.081	16.135	334.096	20.43	-13.99	104.32	5.07	116.84	26.08
60	SAGBEND	-231.95	-90.43	1.01	.140	14.916	346.296	20.00	-14.52	105.78	4.73	117.93	26.32
61	SAGBEND	-243.77	-93.44	.97	.195	13.681	358.496	19.59	-15.00	107.13	4.42	118.94	26.55
62	SAGBEND	-255.66	-96.20	.93	.246	12.431	370.696	19.22	-15.44	108.36	4.14	119.87	26.76
63	SAGBEND	-267.60	-98.69	.87	.294	11.167	382.896	18.89	-15.85	109.47	3.89	120.71	26.94
64	SAGBEND	-279.59	-100.92	.80	.339	9.891	395.096	18.59	-16.20	110.42	3.65	121.42	27.10
65	SAGBEND	-291.64	-102.88	.73	.380	8.605	407.296	18.33	-16.52	111.17	3.42	121.97	27.23
66	SAGBEND	-303.72	-104.57	.64	.419	7.312	419.497	18.11	-16.79	111.60	3.15	122.27	27.29
67	SAGBEND	-315.83	-105.99	.55	.454	6.017	431.697	17.92	-17.02	111.50	2.77	122.12	27.26
68	SAGBEND	-327.98	-107.13	.45	.483	4.729	443.897	17.77	-17.20	110.41	2.15	121.15	27.04
69	SAGBEND	-340.15	-108.00	.35	.502	3.463	456.097	17.65	-17.34	107.37	.98	118.55	26.46
70	SAGBEND	-352.33	-108.61	.24	.501	2.252	468.298	17.57	-17.44	100.40	-1.38	112.66	25.15
71	SAGBEND	-364.53	-108.97	.14	.460	1.164	480.498	17.52	-17.49	85.30	-6.28	100.13	22.35
72	SAGBEND	-376.73	-109.12	.05	.335	.336	492.699	17.51	-17.52	53.29	-16.52	75.23	16.79
73	SEABED	-388.93	-109.15	.00	.094	-.004	504.899	17.51	-17.52	9.27	-17.59	45.76	10.21
74	SEABED	-401.13	-109.14	.00	-.007	-.021	517.099	17.51	-17.52	-1.99	-2.02	32.45	7.24
75	SEABED	-413.33	-109.14	.00	-.006	-.002	529.299	17.51	-17.52	-.82	.78	31.17	6.96
76	SEABED	-425.53	-109.14	.00	.000	.001	541.499	17.51	-17.52	.01	.21	30.49	6.81
77	SEABED	-437.73	-109.14	.00	.000	.000	553.699	17.51	-17.52	.05	-.02	30.38	6.78
78	SEABED	-449.93	-109.14	.00	.000	.000	565.899	17.51	-17.52	.01	-.01	30.35	6.77
79	SEABED	-462.13	-109.14	.00	.000	.000	578.099	17.51	-17.52	.00	.00	30.34	6.77
80	SEABED	-474.33	-109.14	.00	.000	.000	590.299	17.51	-17.52	.00	.00	30.34	6.77
81	SEABED	-486.53	-109.14	.00	.000	.000	602.499	17.51	-17.52	.00	.00	30.34	6.77
82	SEABED	-498.73	-109.14	.00	.000	.000	614.699	17.51	-17.52	.00	.00	30.34	6.77
83	SEABED	-510.93	-109.14	.00	.000	.000	626.899	17.51	-17.52	.00	.00	30.34	6.77

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.47	.00	.00	.00	-1.36	-77.24	.00	77.24
5	LAYBARGE	73.45	5.65	.00	50.07	.00	.00	.00	-2.64	-67.33	.00	67.33
7	TENSIONR	60.11	5.23	.00	43.29	.06	.00	.00	402.80	-22.22	-.05	22.22
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	402.42	-19.37	.00	19.37
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	401.62	-62.15	.00	62.15
11	LAYBARGE	46.45	4.79	.00	37.05	.00	.00	.00	400.87	-190.01	.00	190.01
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	400.63	-210.17	.00	210.17
14	TENSIONR	35.35	4.30	.00	72.47	.10	.00	.00	805.33	-467.89	-.07	467.89
16	LAYBARGE	23.34	3.42	.00	108.62	.00	.00	.00	800.67	-769.85	.00	769.85
18	LAYBARGE	8.89	1.61	.00	61.23	.07	.00	.00	792.59	-935.40	.02	935.40
20	LAYBARGE	3.11	.61	.00	125.43	-.40	.00	.00	787.55	-1093.83	-.39	1093.83

24	STINGER	-7.61	-1.75	.00	16.95	-1.38	.00	.00	785.09	-651.05	-2.49	651.05
26	STINGER	-16.46	-4.05	.00	42.04	-1.22	.00	.00	782.58	-545.09	-1.96	545.09
29	STINGER	-26.08	-6.84	.00	.00	-1.11	.01	.00	779.64	-333.21	-1.61	333.22
32	STINGER	-34.81	-9.55	.00	24.15	-1.68	.00	.00	776.18	-377.70	-2.34	377.71
35	STINGER	-44.19	-12.66	.01	.00	.76	.02	.00	772.15	-444.80	1.49	444.80
38	STINGER	-52.79	-15.76	.01	83.59	-8.26	.00	.00	767.13	-780.26	-12.66	780.36
41	STINGER	-61.91	-19.43	.01	28.61	22.64	.00	.00	762.90	-702.10	41.06	703.30
43	STINGER	-71.77	-23.86	.01	93.35	-33.25	.00	.00	757.08	-758.71	-158.54	775.09
45	STINGER	-74.60	-25.23	.03	.00	.00	.52	.01	756.11	-572.32	-125.63	585.95
47	SAGBEND	-85.42	-30.71	.13	.00	.00	.00	.00	750.21	-123.06	-42.31	130.12
48	SAGBEND	-96.25	-36.34	.27	.00	.00	.00	.00	743.25	82.67	-4.31	82.78
49	SAGBEND	-107.10	-41.90	.42	.00	.00	.00	.00	736.25	178.19	12.60	178.64
50	SAGBEND	-118.02	-47.34	.56	.00	.00	.00	.00	729.43	224.37	19.90	225.25
51	SAGBEND	-129.03	-52.61	.68	.00	.00	.00	.00	722.85	248.37	22.70	249.41
52	SAGBEND	-140.12	-57.69	.78	.00	.00	.00	.00	716.51	262.44	23.16	263.46
53	SAGBEND	-151.30	-62.56	.87	.00	.00	.00	.00	710.43	271.99	22.42	272.91
54	SAGBEND	-162.57	-67.23	.94	.00	.00	.00	.00	704.62	279.37	21.21	280.17
55	SAGBEND	-173.93	-71.68	.98	.00	.00	.00	.00	699.07	285.64	19.84	286.33
56	SAGBEND	-185.38	-75.90	1.02	.00	.00	.00	.00	693.81	291.28	18.48	291.86
57	SAGBEND	-196.91	-79.89	1.04	.00	.00	.00	.00	688.84	296.49	17.18	296.99
58	SAGBEND	-208.51	-83.65	1.04	.00	.00	.00	.00	684.16	301.36	15.97	301.78
59	SAGBEND	-220.20	-87.16	1.03	.00	.00	.00	.00	679.78	305.93	14.87	306.29
60	SAGBEND	-231.95	-90.43	1.01	.00	.00	.00	.00	675.71	310.20	13.86	310.51
61	SAGBEND	-243.77	-93.44	.97	.00	.00	.00	.00	671.95	314.15	12.96	314.42
62	SAGBEND	-255.66	-96.20	.93	.00	.00	.00	.00	668.52	317.78	12.14	318.01
63	SAGBEND	-267.60	-98.69	.87	.00	.00	.00	.00	665.41	321.02	11.40	321.22
64	SAGBEND	-279.59	-100.92	.80	.00	.00	.00	.00	662.63	323.81	10.71	323.99
65	SAGBEND	-291.64	-102.88	.73	.00	.00	.00	.00	660.19	326.00	10.02	326.15
66	SAGBEND	-303.72	-104.57	.64	.00	.00	.00	.00	658.09	327.26	9.23	327.39
67	SAGBEND	-315.83	-105.99	.55	.00	.00	.00	.00	656.33	326.96	8.13	327.07
68	SAGBEND	-327.98	-107.13	.45	.00	.00	.00	.00	654.91	323.77	6.31	323.83
69	SAGBEND	-340.15	-108.00	.35	.00	.00	.00	.00	653.84	314.87	2.87	314.89
70	SAGBEND	-352.33	-108.61	.24	.00	.00	.00	.00	653.12	294.43	-4.05	294.46
71	SAGBEND	-364.53	-108.97	.14	.00	.00	.00	.00	652.74	250.15	-18.41	250.83
72	SAGBEND	-376.73	-109.12	.05	5.00	-4.37	.00	.00	652.66	156.26	-48.45	163.60
73	SEABED	-388.93	-109.15	.00	22.00	-6.48	.00	.00	652.69	27.18	-51.58	58.31
74	SEABED	-401.13	-109.14	.00	18.23	2.82	.00	.00	652.69	-5.84	-5.92	8.31
75	SEABED	-413.33	-109.14	.00	15.16	.85	.00	.00	652.69	-2.40	2.29	3.32
76	SEABED	-425.53	-109.14	.00	14.99	-.06	.00	.00	652.69	.04	.62	.62
77	SEABED	-437.73	-109.14	.00	15.15	-.06	.00	.00	652.69	.15	-.06	.16
78	SEABED	-449.93	-109.14	.00	15.18	.00	.00	.00	652.69	.02	-.04	.05
79	SEABED	-462.13	-109.14	.00	15.18	.00	.00	.00	652.69	-.01	.00	.01
80	SEABED	-474.33	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
81	SEABED	-486.53	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
82	SEABED	-498.73	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
83	SEABED	-510.93	-109.14	.00	.00	.00	.00	.00	652.69	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.32	6.28	0.00	-0.001	1.576	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.29	5.96	0.00	-0.001	1.573	12.04	-0.0001	0.0000	-0.0136	0.0000	0.0136	0.00
5	LAYBARGE	73.46	5.65	0.00	0.000	1.746	22.87	-0.0002	0.0000	-0.0112	0.0000	0.0113	0.00
7	TENSIONR	60.11	5.23	0.00	0.000	1.776	36.22	0.0087	0.0000	-0.0037	0.0000	0.0124	0.00
9	LAYBARGE	57.09	5.14	0.00	0.000	1.809	39.25	0.0087	0.0000	-0.0033	0.0000	0.0119	0.00
10	LAYBARGE	51.10	4.95	0.00	0.000	1.864	45.24	0.0087	0.0000	-0.0105	0.0001	0.0191	0.00
11	LAYBARGE	46.45	4.79	0.00	0.000	2.051	49.89	0.0087	0.0000	-0.0316	-0.0001	0.0403	0.00
13	LAYBARGE	44.92	4.73	0.00	0.000	2.153	51.42	0.0087	0.0000	-0.0349	0.0001	0.0435	0.00
14	TENSIONR	35.36	4.30	0.00	0.000	3.173	60.99	0.0168	0.0000	-0.0778	-0.0004	0.0944	0.00
16	LAYBARGE	23.35	3.42	0.00	0.000	5.433	73.04	0.0167	0.0000	-0.1291	0.0005	0.1456	0.00
18	LAYBARGE	8.90	1.61	0.00	-0.001	8.934	87.61	0.0166	0.0000	-0.1649	-0.0008	0.1811	0.00
20	LAYBARGE	3.12	0.61	0.00	0.000	10.769	93.47	0.0165	0.0000	-0.2707	0.0011	0.2860	0.00
24	STINGER	-7.61	-1.72	0.00	-0.001	13.559	104.46	0.0164	-0.0001	-0.1293	-0.0014	0.1444	0.00
26	STINGER	-16.46	-4.01	0.00	-0.003	15.453	113.61	0.0162	-0.0003	-0.1807	-0.0010	0.1966	0.00
29	STINGER	-26.09	-6.82	0.00	-0.005	16.755	123.63	0.0161	-0.0005	-0.0902	-0.0007	0.1049	0.00
32	STINGER	-34.83	-9.52	0.00	-0.010	17.740	132.78	0.0159	-0.0008	-0.1181	-0.0009	0.1337	0.00
35	STINGER	-44.22	-12.59	0.01	-0.010	18.853	142.67	0.0157	-0.0010	-0.1752	0.0008	0.1912	0.00
38	STINGER	-52.82	-15.67	0.01	-0.025	20.717	151.81	0.0155	-0.0012	-0.1769	-0.0028	0.1913	0.00
41	STINGER	-61.97	-19.34	0.01	0.025	22.875	161.63	0.0153	-0.0015	-0.1637	0.0093	0.1781	0.00
43	STINGER	-71.84	-23.76	0.01	-0.191	25.523	172.44	0.0150	-0.0019	-0.1649	-0.0347	0.1832	0.00
45	STINGER	-74.67	-25.12	0.03	-0.355	26.147	175.58	0.0150	-0.0020	-0.1279	-0.0277	0.1457	0.00
47	SAGBEND	-85.42	-30.56	0.13	-0.711	27.416	187.70	0.0146	-0.0024	-0.0394	-0.0100	0.0557	0.00
48	SAGBEND	-96.26	-36.16	0.28	-0.803	27.432	199.90	0.0143	-0.0028	0.0305	-0.0040	0.0453	0.00
49	SAGBEND	-107.11	-41.73	0.44	-0.772	26.902	212.10	0.0140	-0.0033	0.0457	0.0055	0.0605	0.00
50	SAGBEND	-118.04	-47.16	0.57	-0.715	26.055	224.30	0.0136	-0.0037	0.0529	0.0065	0.0676	0.00
51	SAGBEND	-129.04	-52.42	0.70	-0.620	25.115	236.50	0.0133	-0.0041	0.0554	0.0068	0.0701	0.00
52	SAGBEND	-140.13	-57.51	0.81	-0.513	24.105	248.70	0.0130	-0.0045	0.0574	0.0070	0.0725	0.00
53	SAGBEND	-151.32	-62.38	0.91	-0.412	23.021	260.90	0.0127	-0.0049	0.0580	0.0072	0.0725	0.00
54	SAGBEND	-162.59	-67.02	0.98	-0.322	21.938	273.10	0.0124	-0.0052	0.0598	0.0070	0.0741	0.00
55	SAGBEND	-173.96	-71.47	1.02	-0.238	20.805	285.30	0.0121	-0.0056	0.0603	0.0067	0.0731	0.00
56	SAGBEND	-185.40	-75.70	1.06	-0.148	19.641	297.50	0.0119	-0.0059	0.0608	0.0062	0.0740	0.00
57	SAGBEND	-196.92	-79.69	1.08	-0.087	18.512	309.70	0.0116	-0.0062	0.0612	0.0063	0.0747	0.00
58	SAGBEND	-208.53	-83.45	1.09	-0.018	17.351	321.90	0.0114	-0.0065	0.0609	0.0057	0.0740	0.00
59	SAGBEND	-220.22	-86.94	1.09	0.054	16.122	334.10	0.0112	-0.0068	0.0588	0.0061	0.0731	0.00
60	SAGBEND	-231.97	-90.20	1.07	0.118	14.914	346.30	0.0110	-0.0070	0.0612	0.0067	0.0758	0.00
61	SAGBEND	-243.79	-93.22	1.04	0.181	13.692	358.49	0.0108	-0.0073	0.0634	0.0071	0.0778	0.00
62	SAGBEND	-255.67	-95.98	0.99	0.247	12.470	370.69	0.0107	-0.0075	0.0644	0.0067	0.0788	0.00

63	SAGBEND	-267.62	-98.48	0.92	0.310	11.155	382.89	0.0105	-0.0077	0.0626	0.0062	0.0767	0.00
64	SAGBEND	-279.61	-100.73	0.85	0.361	9.904	395.09	0.0104	-0.0078	0.0611	0.0059	0.0755	0.00
65	SAGBEND	-291.65	-102.72	0.78	0.389	8.688	407.29	0.0103	-0.0080	0.0617	0.0064	0.0760	0.00
66	SAGBEND	-303.73	-104.45	0.70	0.431	7.433	419.49	0.0102	-0.0081	0.0605	0.0075	0.0746	0.00
67	SAGBEND	-315.84	-105.86	0.61	0.465	6.163	431.69	0.0101	-0.0082	0.0626	0.0076	0.0757	0.00
68	SAGBEND	-327.98	-107.05	0.51	0.539	4.880	443.89	0.0101	-0.0083	0.0641	0.0071	0.0770	0.00
69	SAGBEND	-340.15	-107.94	0.40	0.563	3.595	456.09	0.0100	-0.0084	0.0659	0.0069	0.0791	0.00
70	SAGBEND	-352.33	-108.57	0.29	0.587	2.365	468.29	0.0100	-0.0084	0.0607	0.0047	0.0729	0.00
71	SAGBEND	-364.52	-108.94	0.18	0.541	1.253	480.49	0.0100	-0.0085	0.0465	-0.0083	0.0597	0.00
72	SAGBEND	-376.72	-109.12	0.08	0.407	0.466	492.69	0.0100	-0.0085	0.0327	-0.0154	0.0469	0.00
73	SEABED	-388.92	-109.17	0.02	0.180	0.077	504.89	0.0100	-0.0085	0.0161	-0.0126	0.0318	0.00
74	SEABED	-401.12	-109.17	0.00	0.036	-0.025	517.09	0.0101	-0.0085	0.0033	-0.0062	0.0211	0.00
75	SEABED	-413.32	-109.17	0.00	-0.009	-0.016	529.29	0.0101	-0.0085	-0.0011	-0.0014	0.0169	0.00
76	SEABED	-425.52	-109.17	0.00	-0.006	-0.003	541.49	0.0101	-0.0085	-0.0006	0.0004	0.0164	0.00
77	SEABED	-437.72	-109.17	0.00	-0.001	0.001	553.69	0.0101	-0.0085	-0.0002	0.0002	0.0162	0.00
78	SEABED	-449.92	-109.17	0.00	0.000	0.001	565.89	0.0101	-0.0085	0.0001	0.0001	0.0161	0.00
79	SEABED	-462.12	-109.17	0.00	0.000	0.000	578.09	0.0101	-0.0085	0.0000	-0.0001	0.0161	0.00
80	SEABED	-474.32	-109.17	0.00	0.000	0.000	590.29	0.0101	-0.0085	0.0000	0.0000	0.0161	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT VERT (KN)	REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.32	6.28	0.00	16.76	-0.05	0.00	0.00	0.00	4.63	0.01	4.63
3	LAYBARGE	84.29	5.96	0.00	57.03	0.11	0.00	0.00	-4.27	-82.57	0.21	82.57
5	LAYBARGE	73.46	5.65	0.00	50.56	0.10	0.00	0.00	-8.19	-68.11	-0.12	68.11
7	TENSIONR	60.11	5.23	0.00	43.98	0.31	0.00	0.00	443.72	-22.74	-0.15	22.74
9	LAYBARGE	57.09	5.14	0.00	0.00	0.00	0.00	0.00	443.36	-19.87	0.12	19.87
10	LAYBARGE	51.10	4.95	0.00	0.00	0.00	0.00	0.00	442.68	-63.57	0.51	63.57
11	LAYBARGE	46.45	4.79	0.00	38.10	-0.30	0.00	0.00	442.11	-192.11	-0.57	192.11
13	LAYBARGE	44.92	4.73	0.00	0.00	0.00	0.00	0.00	441.93	-211.95	0.82	211.95
14	TENSIONR	35.36	4.30	0.00	76.19	0.23	0.00	0.00	852.58	-472.39	-2.21	472.39
16	LAYBARGE	23.35	3.42	0.00	116.99	0.40	0.00	0.00	848.75	-783.61	3.09	783.61
18	LAYBARGE	8.90	1.61	0.00	150.33	1.31	0.01	0.00	842.13	-1000.85	-4.83	1000.85
20	LAYBARGE	3.12	0.61	0.00	237.96	-5.10	0.02	0.00	837.61	-1470.97	6.49	1470.97
24	STINGER	-7.61	-1.72	0.00	92.57	-7.23	0.15	0.00	836.74	-784.94	-8.76	784.94
26	STINGER	-16.46	-4.01	0.00	148.96	-3.22	0.45	0.00	835.15	-1096.22	-6.15	1096.22
29	STINGER	-26.09	-6.82	0.00	100.93	-2.69	0.44	0.00	833.01	-547.74	-4.29	547.74
32	STINGER	-34.83	-9.52	0.00	128.71	-2.75	0.46	0.00	830.11	-717.11	-5.31	717.12
35	STINGER	-44.22	-12.59	0.01	161.21	1.93	0.44	0.00	826.04	-1063.39	4.74	1063.39
38	STINGER	-52.82	-15.67	0.01	150.33	-10.67	0.10	0.00	821.38	-1073.36	-17.25	1073.46
41	STINGER	-61.97	-19.34	0.01	126.91	30.86	0.00	0.00	817.83	-993.79	56.74	994.76
43	STINGER	-71.84	-23.76	0.01	131.10	-44.57	0.00	0.00	813.02	-1000.67	-210.58	1017.33
45	STINGER	-74.67	-25.12	0.03	0.00	0.00	0.54	0.02	812.17	-776.12	-167.85	789.58
47	SAGBEND	-85.42	-30.56	0.13	0.00	0.00	0.00	0.00	807.14	-238.97	-60.87	243.94
48	SAGBEND	-96.26	-36.16	0.28	0.00	0.00	0.00	0.00	801.12	185.27	-24.03	185.53
49	SAGBEND	-107.11	-41.73	0.44	0.00	0.00	0.00	0.00	795.02	277.52	33.39	278.61
50	SAGBEND	-118.04	-47.16	0.57	0.00	0.00	0.00	0.00	789.04	320.95	39.44	322.48
51	SAGBEND	-129.04	-52.42	0.70	0.00	0.00	0.00	0.00	783.24	336.08	41.48	337.87
52	SAGBEND	-140.13	-57.51	0.81	0.00	0.00	0.00	0.00	777.62	348.45	42.42	350.00
53	SAGBEND	-151.32	-62.38	0.91	0.00	0.00	0.00	0.00	772.19	352.35	43.70	354.97
54	SAGBEND	-162.59	-67.02	0.98	0.00	0.00	0.00	0.00	766.95	363.25	42.37	365.72
55	SAGBEND	-173.96	-71.47	1.02	0.00	0.00	0.00	0.00	761.91	365.75	40.67	366.81
56	SAGBEND	-185.40	-75.70	1.06	0.00	0.00	0.00	0.00	757.52	369.12	37.86	370.43
57	SAGBEND	-196.92	-79.69	1.08	0.00	0.00	0.00	0.00	753.43	371.80	38.22	372.80
58	SAGBEND	-208.53	-83.45	1.09	0.00	0.00	0.00	0.00	749.63	369.76	34.67	370.54
59	SAGBEND	-220.22	-86.94	1.09	0.00	0.00	0.00	0.00	746.16	357.06	37.25	357.72
60	SAGBEND	-231.97	-90.20	1.07	0.00	0.00	0.00	0.00	743.06	371.27	40.44	372.14
61	SAGBEND	-243.79	-93.22	1.04	0.00	0.00	0.00	0.00	740.36	384.59	43.01	386.55
62	SAGBEND	-255.67	-95.98	0.99	0.00	0.00	0.00	0.00	738.06	391.15	40.63	392.47
63	SAGBEND	-267.62	-98.48	0.92	0.00	0.00	0.00	0.00	736.14	380.22	37.92	380.43
64	SAGBEND	-279.61	-100.73	0.85	0.00	0.00	0.00	0.00	734.52	371.13	35.72	371.59
65	SAGBEND	-291.65	-102.72	0.78	0.00	0.00	0.00	0.00	733.17	374.72	39.15	375.24
66	SAGBEND	-303.73	-104.45	0.70	0.00	0.00	0.00	0.00	732.07	367.17	45.63	367.40
67	SAGBEND	-315.84	-105.86	0.61	0.00	0.00	0.00	0.00	731.23	379.82	46.05	381.25
68	SAGBEND	-327.98	-107.05	0.51	0.00	0.00	0.00	0.00	730.70	389.10	43.38	390.42
69	SAGBEND	-340.15	-107.94	0.40	0.00	0.00	0.00	0.00	730.51	399.99	42.16	401.86
70	SAGBEND	-352.33	-108.57	0.29	0.00	0.00	0.00	0.00	730.71	368.20	28.77	368.67
71	SAGBEND	-364.52	-108.94	0.18	1.48	-0.98	0.00	0.00	731.26	282.12	-50.54	282.83
72	SAGBEND	-376.72	-109.12	0.08	17.61	-10.31	0.00	0.00	732.11	198.21	-93.56	200.80
73	SEABED	-388.92	-109.17	0.02	22.02	-10.68	0.00	0.00	733.07	98.00	-76.53	108.05
74	SEABED	-401.12	-109.17	0.00	19.41	2.83	0.00	0.00	733.96	19.87	-37.38	38.63
75	SEABED	-413.32	-109.17	0.00	17.15	1.75	0.00	0.00	734.81	-6.49	-8.27	9.47
76	SEABED	-425.52	-109.17	0.00	15.60	0.75	0.00	0.00	735.63	-3.61	2.71	3.81
77	SEABED	-437.72	-109.17	0.00	15.17	0.16	0.00	0.00	736.41	-1.05	1.35	1.47
78	SEABED	-449.92	-109.17	0.00	15.21	-0.08	0.00	0.00	737.16	0.41	0.43	0.44
79	SEABED	-462.12	-109.17	0.00	15.21	-0.07	0.00	0.00	737.86	0.17	-0.39	0.39
80	SEABED	-474.32	-109.17	0.00	0.00	-0.01	0.00	0.00	738.53	0.00	0.00	0.00

Water Depth 109 m (180°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.96	.00	19.63	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	16.39	.00	-7.57	.00	22.82	5.09
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	16.37	.00	-6.61	.00	21.99	4.91
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	16.34	.00	-21.22	.00	34.38	7.67
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	16.31	.00	-64.84	.00	71.42	15.94
13	LAYBARGE	44.91	4.73	.00	.000	2.151	51.425	16.30	.00	-71.68	.00	77.23	17.24
14	TENSIONR	35.35	4.30	.00	.000	3.171	60.993	32.76	.00	-159.41	.00	168.26	37.56
16	LAYBARGE	23.34	3.42	.00	.000	5.439	73.039	32.57	.00	-263.29	.00	256.37	57.23
18	LAYBARGE	8.89	1.61	.00	.000	8.909	87.606	32.24	.00	-315.90	.00	300.76	67.13
20	LAYBARGE	3.11	.61	.00	.000	10.844	93.474	32.02	.00	-392.73	.00	365.84	81.66
24	STINGER	-7.60	-1.77	.00	.000	13.887	104.439	31.79	-.28	-228.88	.00	226.47	50.55
26	STINGER	-16.44	-4.10	.00	.000	15.710	113.583	31.48	-.66	-208.64	.00	209.16	46.69
29	STINGER	-26.05	-6.96	.00	.000	17.208	123.616	31.13	-1.12	-123.53	.00	136.70	30.51
32	STINGER	-34.76	-9.74	.00	.000	18.262	132.760	30.76	-1.56	-131.59	.00	143.39	32.01
35	STINGER	-44.14	-12.95	.00	.000	19.494	142.668	30.33	-2.08	-145.66	.00	155.18	34.64
38	STINGER	-52.72	-16.11	.00	.000	21.142	151.812	29.86	-2.59	-250.03	.00	243.69	54.39
41	STINGER	-61.81	-19.83	.00	.000	23.257	161.639	29.38	-3.18	-224.01	.00	221.40	49.42
43	STINGER	-71.66	-24.29	.00	.000	25.567	172.448	28.77	-3.90	-251.06	.00	244.14	54.50
45	STINGER	-74.48	-25.66	.00	.000	26.221	175.585	28.62	-4.12	-189.05	.00	191.40	42.72
47	SAGBEND	-85.27	-31.15	.00	.000	27.421	187.696	27.92	-5.00	-39.02	.00	63.73	14.23
48	SAGBEND	-96.10	-36.78	.00	.000	27.421	199.895	27.17	-5.91	29.96	.00	55.82	12.46
49	SAGBEND	-106.95	-42.35	.00	.000	26.864	212.095	26.42	-6.80	62.05	.00	82.77	18.47
50	SAGBEND	-117.87	-47.79	.00	.000	26.044	224.295	25.69	-7.67	77.60	.00	95.71	21.36
51	SAGBEND	-128.88	-53.06	.00	.000	25.092	236.495	24.99	-8.52	85.72	.00	102.37	22.85
52	SAGBEND	-139.97	-58.13	.00	.000	24.068	248.695	24.31	-9.33	90.49	.00	106.20	23.70
53	SAGBEND	-151.15	-63.00	.00	.000	22.998	260.895	23.66	-10.12	93.72	.00	108.73	24.27
54	SAGBEND	-162.43	-67.66	.00	.000	21.896	273.095	23.04	-10.86	96.22	.00	110.65	24.70
55	SAGBEND	-173.79	-72.10	.00	.000	20.767	285.295	22.44	-11.58	98.33	.00	112.26	25.06
56	SAGBEND	-185.24	-76.31	.00	.000	19.615	297.495	21.88	-12.25	100.23	.00	113.69	25.38
57	SAGBEND	-196.78	-80.29	.00	.000	18.442	309.695	21.35	-12.89	101.97	.00	115.01	25.67
58	SAGBEND	-208.39	-84.03	.00	.000	17.249	321.895	20.85	-13.49	103.59	.00	116.23	25.95
59	SAGBEND	-220.08	-87.52	.00	.000	16.038	334.095	20.38	-14.05	105.10	.00	117.38	26.20
60	SAGBEND	-231.84	-90.77	.00	.000	14.810	346.296	19.95	-14.57	106.51	.00	118.44	26.44
61	SAGBEND	-243.67	-93.76	.00	.000	13.567	358.496	19.55	-15.05	107.81	.00	119.43	26.66
62	SAGBEND	-255.56	-96.49	.00	.000	12.309	370.696	19.18	-15.49	108.99	.00	120.32	26.86
63	SAGBEND	-267.50	-98.96	.00	.000	11.038	382.896	18.86	-15.89	110.03	.00	121.11	27.03
64	SAGBEND	-279.50	-101.16	.00	.000	9.756	395.096	18.56	-16.24	110.92	.00	121.78	27.18
65	SAGBEND	-291.55	-103.09	.00	.000	8.465	407.296	18.30	-16.55	111.59	.00	122.27	27.29
66	SAGBEND	-303.64	-104.75	.00	.000	7.168	419.496	18.08	-16.82	111.92	.00	122.50	27.34
67	SAGBEND	-315.76	-106.14	.00	.000	5.870	431.697	17.90	-17.04	111.69	.00	122.24	27.29
68	SAGBEND	-327.91	-107.25	.00	.000	4.581	443.897	17.75	-17.22	110.38	.00	121.10	27.03
69	SAGBEND	-340.08	-108.09	.00	.000	3.317	456.097	17.64	-17.35	106.96	.00	118.19	26.38
70	SAGBEND	-352.26	-108.66	.00	.000	2.115	468.298	17.56	-17.45	99.25	.00	111.67	24.93
71	SAGBEND	-364.46	-109.00	.00	.000	1.047	480.498	17.52	-17.50	82.67	.00	97.72	21.81
72	SEABED	-376.66	-109.13	.00	.000	.266	492.699	17.51	-17.52	47.61	.00	68.44	15.28
73	SEABED	-388.86	-109.15	.00	.000	-.015	504.899	17.51	-17.52	6.30	.00	35.08	7.83
74	SEABED	-401.06	-109.14	.00	.000	-.018	517.099	17.51	-17.52	-2.04	.00	31.85	7.11
75	SEABED	-413.26	-109.14	.00	.000	-.001	529.299	17.51	-17.52	-.65	.00	30.81	6.88
76	SEABED	-425.46	-109.14	.00	.000	.001	541.499	17.51	-17.52	.04	.00	30.37	6.78
77	SEABED	-437.66	-109.14	.00	.000	.000	553.699	17.51	-17.52	.04	.00	30.37	6.78
78	SEABED	-449.86	-109.14	.00	.000	.000	565.899	17.51	-17.52	.00	.00	30.34	6.77
79	SEABED	-462.06	-109.14	.00	.000	.000	578.099	17.51	-17.52	.00	.00	30.34	6.77
80	SEABED	-474.26	-109.14	.00	.000	.000	590.299	17.51	-17.52	.00	.00	30.34	6.77
81	SEABED	-486.46	-109.14	.00	.000	.000	602.499	17.51	-17.52	.00	.00	30.34	6.77
82	SEABED	-498.66	-109.14	.00	.000	.000	614.699	17.51	-17.52	.00	.00	30.34	6.77
83	SEABED	-510.86	-109.14	.00	.000	.000	626.899	17.51	-17.52	.00	.00	30.34	6.77

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.46	.00	.00	.00	-1.36	-77.23	.00	77.23
5	LAYBARGE	73.45	5.65	.00	50.07	.00	.00	.00	-2.64	-67.34	.00	67.34
7	TENSIONR	60.11	5.23	.00	43.27	.00	.00	.00	402.77	-22.19	.00	22.19
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	402.39	-19.37	.00	19.37
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	401.60	-62.24	.00	62.24
11	LAYBARGE	46.45	4.79	.00	37.13	.00	.00	.00	400.85	-190.15	.00	190.15
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	400.61	-210.21	.00	210.21
14	TENSIONR	35.35	4.30	.00	72.13	.00	.00	.00	805.31	-467.47	.00	467.47
16	LAYBARGE	23.34	3.42	.00	109.70	.00	.00	.00	800.63	-772.10	.00	772.10
18	LAYBARGE	8.89	1.61	.00	48.90	.00	.00	.00	792.61	-926.36	.00	926.36
20	LAYBARGE	3.11	.61	.00	141.99	.00	.00	.00	787.16	-1151.66	.00	1151.66

24	STINGER	-7.60	-1.77	.00	9.84	.00	.00	.00	784.97	-671.18	.00	671.18
26	STINGER	-16.44	-4.10	.00	53.22	.00	.00	.00	782.27	-611.83	.00	611.83
29	STINGER	-26.05	-6.96	.00	.00	.00	.00	.00	779.41	-362.25	.00	362.25
32	STINGER	-34.76	-9.74	.00	24.92	.00	.00	.00	775.90	-385.88	.00	385.88
35	STINGER	-44.14	-12.95	.00	.00	.00	.02	.00	771.82	-427.14	.00	427.14
38	STINGER	-52.72	-16.11	.00	78.58	.00	.00	.00	766.88	-733.20	.00	733.20
41	STINGER	-61.81	-19.83	.00	25.02	.00	.00	.00	762.56	-656.90	.00	656.90
43	STINGER	-71.66	-24.29	.00	93.47	.00	.00	.00	756.69	-736.22	.00	736.22
45	STINGER	-74.48	-25.66	.00	.00	.00	.53	.00	755.65	-554.39	.00	554.39
47	SAGBEND	-85.27	-31.15	.00	.00	.00	.00	.00	749.66	-114.42	.00	114.42
48	SAGBEND	-96.10	-36.78	.00	.00	.00	.00	.00	742.67	87.87	.00	87.87
49	SAGBEND	-106.95	-42.35	.00	.00	.00	.00	.00	735.67	181.95	.00	181.95
50	SAGBEND	-117.87	-47.79	.00	.00	.00	.00	.00	728.85	227.55	.00	227.55
51	SAGBEND	-128.88	-53.06	.00	.00	.00	.00	.00	722.27	251.36	.00	251.36
52	SAGBEND	-139.97	-58.13	.00	.00	.00	.00	.00	715.93	265.35	.00	265.35
53	SAGBEND	-151.15	-63.00	.00	.00	.00	.00	.00	709.86	274.84	.00	274.84
54	SAGBEND	-162.43	-67.66	.00	.00	.00	.00	.00	704.05	282.17	.00	282.17
55	SAGBEND	-173.79	-72.10	.00	.00	.00	.00	.00	698.52	288.36	.00	288.36
56	SAGBEND	-185.24	-76.31	.00	.00	.00	.00	.00	693.28	293.91	.00	293.91
57	SAGBEND	-196.78	-80.29	.00	.00	.00	.00	.00	688.32	299.02	.00	299.02
58	SAGBEND	-208.39	-84.03	.00	.00	.00	.00	.00	683.66	303.77	.00	303.77
59	SAGBEND	-220.08	-87.52	.00	.00	.00	.00	.00	679.31	308.21	.00	308.21
60	SAGBEND	-231.84	-90.77	.00	.00	.00	.00	.00	675.26	312.34	.00	312.34
61	SAGBEND	-243.67	-93.76	.00	.00	.00	.00	.00	671.54	316.14	.00	316.14
62	SAGBEND	-255.56	-96.49	.00	.00	.00	.00	.00	668.13	319.60	.00	319.60
63	SAGBEND	-267.50	-98.96	.00	.00	.00	.00	.00	665.06	322.67	.00	322.67
64	SAGBEND	-279.50	-101.16	.00	.00	.00	.00	.00	662.31	325.27	.00	325.27
65	SAGBEND	-291.55	-103.09	.00	.00	.00	.00	.00	659.91	327.24	.00	327.24
66	SAGBEND	-303.64	-104.75	.00	.00	.00	.00	.00	657.84	328.22	.00	328.22
67	SAGBEND	-315.76	-106.14	.00	.00	.00	.00	.00	656.12	327.52	.00	327.52
68	SAGBEND	-327.91	-107.25	.00	.00	.00	.00	.00	654.74	323.69	.00	323.69
69	SAGBEND	-340.08	-108.09	.00	.00	.00	.00	.00	653.72	313.66	.00	313.66
70	SAGBEND	-352.26	-108.66	.00	.00	.00	.00	.00	653.04	291.05	.00	291.05
71	SAGBEND	-364.46	-109.00	.00	.00	.00	.00	.00	652.70	242.43	.00	242.43
72	SEABED	-376.66	-109.13	.00	7.21	.00	.00	.00	652.64	139.63	.00	139.63
73	SEABED	-388.86	-109.15	.00	22.31	.00	.00	.00	652.69	18.48	.00	18.48
74	SEABED	-401.06	-109.14	.00	17.61	.00	.00	.00	652.69	-5.99	.00	5.99
75	SEABED	-413.26	-109.14	.00	15.06	.00	.00	.00	652.69	-1.90	.00	1.90
76	SEABED	-425.46	-109.14	.00	15.01	.00	.00	.00	652.69	.11	.00	.11
77	SEABED	-437.66	-109.14	.00	15.16	.00	.00	.00	652.69	.13	.00	.13
78	SEABED	-449.86	-109.14	.00	15.18	.00	.00	.00	652.69	.01	.00	.01
79	SEABED	-462.06	-109.14	.00	15.18	.00	.00	.00	652.69	-.01	.00	.01
80	SEABED	-474.26	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
81	SEABED	-486.46	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
82	SEABED	-498.66	-109.14	.00	15.17	.00	.00	.00	652.69	.00	.00	.00
83	SEABED	-510.86	-109.14	.00	.00	.00	.00	.00	652.69	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.32	6.28	0.00	0.000	1.575	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.29	5.96	0.00	0.000	1.572	12.04	-0.0001	0.0000	-0.0136	0.0000	0.0136	0.00
5	LAYBARGE	73.46	5.65	0.00	0.000	1.744	22.87	-0.0001	0.0000	-0.0112	0.0000	0.0113	0.00
7	TENSIONR	60.11	5.23	0.00	0.000	1.774	36.22	0.0087	0.0000	-0.0037	0.0000	0.0124	0.00
9	LAYBARGE	57.09	5.14	0.00	0.000	1.807	39.25	0.0087	0.0000	-0.0033	0.0000	0.0120	0.00
10	LAYBARGE	51.10	4.95	0.00	0.000	1.862	45.24	0.0087	0.0000	-0.0105	0.0000	0.0191	0.00
11	LAYBARGE	46.46	4.79	0.00	0.000	2.048	49.89	0.0087	0.0000	-0.0317	0.0000	0.0403	0.00
13	LAYBARGE	44.92	4.73	0.00	0.000	2.150	51.42	0.0087	0.0000	-0.0350	0.0000	0.0436	0.00
14	TENSIONR	35.37	4.30	0.00	0.000	3.170	60.99	0.0167	0.0000	-0.0778	0.0000	0.0942	0.00
16	LAYBARGE	23.35	3.42	0.00	0.000	5.437	73.04	0.0167	0.0000	-0.1296	0.0000	0.1461	0.00
18	LAYBARGE	8.90	1.61	0.00	0.000	8.913	87.61	0.0165	0.0000	-0.1641	0.0000	0.1797	0.00
20	LAYBARGE	3.12	0.61	0.00	0.000	10.760	93.47	0.0164	0.0000	-0.2871	0.0000	0.3029	0.00
24	STINGER	-7.60	-1.71	0.00	0.000	13.581	104.46	0.0163	-0.0001	-0.1381	0.0000	0.1538	0.00
26	STINGER	-16.46	-4.00	0.00	0.000	15.544	113.61	0.0162	-0.0003	-0.1917	0.0000	0.2064	0.00
29	STINGER	-26.07	-6.83	0.00	0.000	16.988	123.64	0.0161	-0.0006	-0.1007	0.0000	0.1154	0.00
32	STINGER	-34.80	-9.61	0.00	0.000	18.000	132.78	0.0159	-0.0008	-0.1312	0.0000	0.1472	0.00
35	STINGER	-44.18	-12.72	0.00	0.000	19.288	142.67	0.0157	-0.0010	-0.1798	0.0000	0.1954	0.00
38	STINGER	-52.77	-15.88	0.00	0.000	21.025	151.81	0.0155	-0.0013	-0.1737	0.0000	0.1893	0.00
41	STINGER	-61.87	-19.61	0.00	0.000	23.050	161.63	0.0153	-0.0015	-0.1710	-0.0002	0.1853	0.00
43	STINGER	-71.72	-24.05	0.00	0.000	25.725	172.44	0.0150	-0.0019	-0.1659	0.0005	0.1805	0.00
45	STINGER	-74.54	-25.41	0.00	0.000	26.334	175.58	0.0149	-0.0020	-0.1299	0.0004	0.1444	0.00
47	SAGBEND	-85.29	-30.87	0.00	0.000	27.467	187.70	0.0146	-0.0024	-0.0413	-0.0002	0.0558	0.00
48	SAGBEND	-96.11	-36.51	0.00	-0.001	27.524	199.90	0.0143	-0.0029	0.0328	-0.0002	0.0470	0.00
49	SAGBEND	-106.97	-42.06	0.00	-0.001	26.977	212.10	0.0139	-0.0033	0.0465	-0.0002	0.0610	0.00
50	SAGBEND	-117.91	-47.48	0.00	-0.001	26.105	224.30	0.0136	-0.0037	0.0557	-0.0003	0.0697	0.00
51	SAGBEND	-128.92	-52.75	0.00	-0.001	25.126	236.50	0.0132	-0.0041	0.0615	0.0003	0.0757	0.00
52	SAGBEND	-140.01	-57.83	0.00	-0.001	24.126	248.70	0.0129	-0.0045	0.0638	0.0002	0.0778	0.00
53	SAGBEND	-151.20	-62.69	0.00	-0.001	23.014	260.90	0.0127	-0.0049	0.0604	0.0002	0.0744	0.00
54	SAGBEND	-162.48	-67.36	0.00	0.000	21.864	273.10	0.0124	-0.0053	0.0608	0.0002	0.0752	0.00
55	SAGBEND	-173.84	-71.78	0.00	0.001	20.779	285.30	0.0121	-0.0056	0.0626	0.0002	0.0761	0.00
56	SAGBEND	-185.28	-76.00	0.00	0.000	19.727	297.50	0.0118	-0.0059	0.0640	0.0002	0.0770	0.00
57	SAGBEND	-196.82	-79.99	0.00	0.000	18.553	309.70	0.0116	-0.0062	0.0627	-0.0002	0.0754	0.00
58	SAGBEND	-208.42	-83.71	0.00	0.000	17.307	321.90	0.0114	-0.0065	0.0610	-0.0002	0.0740	0.00
59	SAGBEND	-220.11	-87.23	0.00	0.000	16.089	334.10	0.0111	-0.0068	0.0655	-0.0002	0.0782	0.00
60	SAGBEND	-231.87	-90.51	0.00	0.000	14.860	346.30	0.0109	-0.0071	0.0661	-0.0002	0.0792	0.00
61	SAGBEND	-243.69	-93.50	0.00	0.000	13.639	358.50	0.0108	-0.0073	0.0659	-0.0002	0.0800	0.00
62	SAGBEND	-255.58	-96.25	0.00	0.000	12.416	370.70	0.0106	-0.0075	0.0648	0.0002	0.0785	0.00
63	SAGBEND	-267.52	-98.73	0.00	0.000	11.111	382.89	0.0105	-0.0077	0.0623	0.0002	0.0759	0.00

64	SAGBEND	-279.52	-100.96	0.00	0.000	9.801	395.09	0.0104	-0.0079	0.0646	-0.0002	0.0784	0.00
65	SAGBEND	-291.56	-102.93	0.00	0.001	8.605	407.29	0.0103	-0.0080	0.0665	-0.0002	0.0800	0.00
66	SAGBEND	-303.64	-104.59	0.00	0.001	7.400	419.49	0.0102	-0.0081	0.0649	0.0002	0.0790	0.00
67	SAGBEND	-315.76	-105.98	0.00	0.001	6.073	431.69	0.0101	-0.0082	0.0654	-0.0003	0.0781	0.00
68	SAGBEND	-327.90	-107.16	0.00	0.001	4.721	443.89	0.0101	-0.0083	0.0687	0.0003	0.0820	0.00
69	SAGBEND	-340.07	-108.02	0.00	0.001	3.496	456.09	0.0100	-0.0084	0.0681	0.0003	0.0815	0.00
70	SAGBEND	-352.26	-108.61	0.00	0.000	2.222	468.29	0.0100	-0.0084	0.0608	0.0002	0.0733	0.00
71	SAGBEND	-364.45	-108.95	0.00	0.000	1.128	480.49	0.0100	-0.0085	0.0504	-0.0001	0.0643	0.00
72	SAGBEND	-376.65	-109.12	0.00	0.001	0.442	492.69	0.0100	-0.0085	0.0320	-0.0003	0.0449	0.00
73	SEABED	-388.85	-109.17	0.00	0.000	0.082	504.89	0.0101	-0.0085	0.0172	-0.0002	0.0300	0.00
74	SEABED	-401.05	-109.17	0.00	0.000	-0.022	517.09	0.0101	-0.0085	0.0038	-0.0001	0.0180	0.00
75	SEABED	-413.25	-109.17	0.00	0.000	-0.015	529.29	0.0101	-0.0085	-0.0012	0.0000	0.0171	0.00
76	SEABED	-425.45	-109.17	0.00	0.000	-0.004	541.49	0.0101	-0.0085	-0.0007	0.0000	0.0165	0.00
77	SEABED	-437.65	-109.17	0.00	0.000	0.000	553.69	0.0101	-0.0085	-0.0002	0.0000	0.0162	0.00
78	SEABED	-449.85	-109.17	0.00	0.000	0.000	565.89	0.0102	-0.0085	0.0001	0.0000	0.0162	0.00
79	SEABED	-462.05	-109.17	0.00	0.000	0.000	578.09	0.0102	-0.0085	0.0000	0.0000	0.0162	0.00
80	SEABED	-474.25	-109.17	0.00	0.000	0.000	590.29	0.0102	-0.0085	0.0000	0.0000	0.0162	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.32	6.28	0.00	16.82	0.00	0.00	0.00	0.00	4.65	0.00	4.65
3	LAYBARGE	84.29	5.96	0.00	57.03	-0.01	0.00	0.00	-3.77	-82.66	0.01	82.66
5	LAYBARGE	73.46	5.65	0.00	50.48	-0.01	0.00	0.00	-7.23	-68.16	0.00	68.16
7	TENSIONR	60.11	5.23	0.00	43.64	-0.01	0.00	0.00	444.09	-22.57	0.00	22.57
9	LAYBARGE	57.09	5.14	0.00	0.00	0.00	0.00	0.00	443.78	-20.02	0.00	20.02
10	LAYBARGE	51.10	4.95	0.00	0.00	0.00	0.00	0.00	443.13	-63.86	0.02	63.86
11	LAYBARGE	46.46	4.79	0.00	37.99	-0.01	0.00	0.00	442.52	-192.44	0.02	192.44
13	LAYBARGE	44.92	4.73	0.00	0.00	0.00	0.00	0.00	442.32	-212.45	0.03	212.45
14	TENSIONR	35.37	4.30	0.00	76.12	0.00	0.00	0.00	851.97	-472.17	0.09	472.17
16	LAYBARGE	23.35	3.42	0.00	118.40	-0.01	0.00	0.00	847.58	-786.57	0.13	786.57
18	LAYBARGE	8.90	1.61	0.00	144.59	-0.01	0.01	0.00	840.03	-995.85	0.16	995.85
20	LAYBARGE	3.12	0.61	0.00	245.42	-0.02	0.02	0.00	835.31	-1497.48	0.21	1497.48
24	STINGER	-7.60	-1.71	0.00	86.82	-0.03	0.15	0.00	835.01	-838.11	0.18	838.11
26	STINGER	-16.46	-4.00	0.00	165.76	-0.02	0.45	0.00	833.66	-1162.15	-0.16	1162.15
29	STINGER	-26.07	-6.83	0.00	79.99	-0.02	0.43	0.00	831.03	-611.28	0.11	611.28
32	STINGER	-34.80	-9.61	0.00	142.09	-0.03	0.64	0.00	827.59	-796.32	0.13	796.32
35	STINGER	-44.18	-12.72	0.00	154.76	-0.06	0.60	0.00	823.78	-1090.92	0.15	1090.92
38	STINGER	-52.77	-15.88	0.00	122.92	-0.14	0.15	0.00	821.61	-1053.90	0.24	1053.90
41	STINGER	-61.87	-19.61	0.00	136.59	-0.50	0.03	0.00	817.59	-1037.78	-0.93	1037.78
43	STINGER	-71.72	-24.05	0.00	132.11	-0.64	0.00	0.00	811.45	-1007.21	3.14	1007.22
45	STINGER	-74.54	-25.41	0.00	0.00	0.00	0.55	0.00	810.69	-788.41	2.54	788.41
47	SAGBEND	-85.29	-30.87	0.00	0.00	0.00	0.00	0.00	805.58	-250.93	-1.17	250.94
48	SAGBEND	-96.11	-36.51	0.00	0.00	0.00	0.00	0.00	799.27	199.18	-0.97	199.18
49	SAGBEND	-106.97	-42.06	0.00	0.00	0.00	0.00	0.00	792.82	281.97	-1.40	281.97
50	SAGBEND	-117.91	-47.48	0.00	0.00	0.00	0.00	0.00	786.63	338.13	-1.59	338.13
51	SAGBEND	-128.92	-52.75	0.00	0.00	0.00	0.00	0.00	781.05	373.35	1.58	373.35
52	SAGBEND	-140.01	-57.83	0.00	0.00	0.00	0.00	0.00	775.86	386.99	1.49	386.99
53	SAGBEND	-151.20	-62.69	0.00	0.00	0.00	0.00	0.00	770.95	366.77	1.16	366.77
54	SAGBEND	-162.48	-67.36	0.00	0.00	0.00	0.00	0.00	766.18	368.78	1.04	368.78
55	SAGBEND	-173.84	-71.78	0.00	0.00	0.00	0.00	0.00	761.53	379.73	1.04	379.73
56	SAGBEND	-185.28	-76.00	0.00	0.00	0.00	0.00	0.00	757.03	388.20	1.19	388.20
57	SAGBEND	-196.82	-79.99	0.00	0.00	0.00	0.00	0.00	752.74	380.59	-1.43	380.59
58	SAGBEND	-208.42	-83.71	0.00	0.00	0.00	0.00	0.00	748.74	370.11	-1.46	370.11
59	SAGBEND	-220.11	-87.23	0.00	0.00	0.00	0.00	0.00	745.09	397.40	-1.26	397.40
60	SAGBEND	-231.87	-90.51	0.00	0.00	0.00	0.00	0.00	741.88	401.41	-1.33	401.41
61	SAGBEND	-243.69	-93.50	0.00	0.00	0.00	0.00	0.00	739.19	399.93	-1.48	399.93
62	SAGBEND	-255.58	-96.25	0.00	0.00	0.00	0.00	0.00	737.04	393.06	1.34	393.06
63	SAGBEND	-267.52	-98.73	0.00	0.00	0.00	0.00	0.00	735.38	378.46	1.13	378.46
64	SAGBEND	-279.52	-100.96	0.00	0.00	0.00	0.00	0.00	734.12	392.09	-1.09	392.09
65	SAGBEND	-291.56	-102.93	0.00	0.00	0.00	0.00	0.00	733.14	403.59	-0.92	403.59
66	SAGBEND	-303.64	-104.59	0.00	0.00	0.00	0.00	0.00	732.37	393.96	1.21	393.96
67	SAGBEND	-315.76	-105.98	0.00	0.00	0.00	0.00	0.00	731.78	397.20	-1.61	397.20
68	SAGBEND	-327.90	-107.16	0.00	0.00	0.00	0.00	0.00	731.36	417.14	1.75	417.14
69	SAGBEND	-340.07	-108.02	0.00	0.00	0.00	0.00	0.00	731.18	413.59	1.58	413.59
70	SAGBEND	-352.26	-108.61	0.00	0.00	0.00	0.00	0.00	731.34	369.02	1.23	369.02
71	SAGBEND	-364.45	-108.95	0.00	4.06	0.13	0.00	0.00	732.11	305.98	-0.87	305.98
72	SAGBEND	-376.65	-109.12	0.00	21.37	0.29	0.00	0.00	733.15	194.42	-1.74	194.42
73	SEABED	-388.85	-109.17	0.00	23.43	-0.15	0.00	0.00	734.37	104.63	-1.29	104.63
74	SEABED	-401.05	-109.17	0.00	19.65	0.06	0.00	0.00	735.52	22.99	-0.37	22.99
75	SEABED	-413.25	-109.17	0.00	17.25	0.03	0.00	0.00	736.62	-7.40	-0.08	7.40
76	SEABED	-425.45	-109.17	0.00	15.73	-0.01	0.00	0.00	737.69	-3.95	0.06	3.95
77	SEABED	-437.65	-109.17	0.00	15.28	-0.01	0.00	0.00	738.72	-1.17	0.03	1.17
78	SEABED	-449.85	-109.17	0.00	15.29	0.00	0.00	0.00	739.70	0.68	-0.02	0.68
79	SEABED	-462.05	-109.17	0.00	15.23	-0.01	0.00	0.00	740.64	0.21	-0.03	0.21
80	SEABED	-474.25	-109.17	0.00	0.00	0.00	0.00	0.00	741.52	0.00	0.00	0.00

LAMPIRAN C-2

HASIL *OUTPUT SOFTWARE OFFPIPE*

(*WATER DEPTH* = 101 M)

Water Depth 101 (0°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.745	22.869	-.11	.00	-22.95	.00	19.61	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	16.39	.00	-7.61	.00	22.85	5.10
9	LAYBARGE	57.08	5.14	.00	.000	1.809	39.248	16.37	.00	-6.60	.00	21.98	4.91
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	16.34	.00	-21.09	.00	34.26	7.65
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	16.31	.00	-64.64	.00	71.25	15.90
13	LAYBARGE	44.91	4.73	.00	.000	2.150	51.425	16.30	.00	-71.61	.00	77.17	17.23
14	TENSIONR	35.35	4.30	.00	.000	3.174	60.993	32.76	.00	-160.05	.00	168.80	37.68
16	LAYBARGE	23.34	3.42	.00	.000	5.426	73.039	32.57	.00	-259.88	.00	253.47	56.58
18	LAYBARGE	8.89	1.61	.00	.000	8.962	87.606	32.24	.00	-329.56	.00	312.36	69.72
20	LAYBARGE	3.11	.61	.00	.000	10.693	93.474	32.08	.00	-305.23	.00	291.53	65.07
24	STINGER	-7.61	-1.66	.00	.000	13.034	104.432	31.82	-.27	-176.80	.00	182.23	40.68
26	STINGER	-16.49	-3.84	.00	.000	14.526	113.576	31.53	-.62	-182.48	.00	186.95	41.73
29	STINGER	-26.15	-6.47	.00	.000	15.849	123.582	31.20	-1.04	-112.64	.00	127.47	28.45
32	STINGER	-34.92	-9.05	.00	.000	16.855	132.727	30.85	-1.45	-131.28	.00	143.17	31.96
35	STINGER	-44.35	-12.01	.00	.000	18.123	142.612	30.45	-1.93	-154.68	.00	162.90	36.36
38	STINGER	-53.00	-14.98	.00	.000	19.904	151.756	30.00	-2.40	-272.89	.00	263.17	58.74
41	STINGER	-62.17	-18.51	.00	.000	22.213	161.584	29.54	-2.97	-244.33	.00	238.72	53.29
43	STINGER	-72.09	-22.81	.00	.000	24.673	172.397	28.96	-3.66	-261.51	.00	253.10	56.49
45	STINGER	-74.95	-24.15	.00	.000	25.356	175.552	28.81	-3.88	-195.79	.00	197.20	44.02
47	SAGBEND	-85.85	-29.49	.00	.000	26.583	187.696	28.14	-4.74	-37.61	.00	62.61	13.98
48	SAGBEND	-96.76	-34.96	.00	.000	26.546	199.896	27.41	-5.61	34.60	.00	59.82	13.35
49	SAGBEND	-107.70	-40.36	.00	.000	25.927	212.096	26.68	-6.48	67.88	.00	87.80	19.60
50	SAGBEND	-118.71	-45.61	.00	.000	25.037	224.296	25.98	-7.32	83.65	.00	100.94	22.53
51	SAGBEND	-129.81	-50.68	.00	.000	24.016	236.496	25.30	-8.14	91.50	.00	107.37	23.97
52	SAGBEND	-141.00	-55.54	.00	.000	22.927	248.696	24.65	-8.92	95.73	.00	110.75	24.72
53	SAGBEND	-152.28	-60.18	.00	.000	21.800	260.896	24.03	-9.66	98.32	.00	112.75	25.17
54	SAGBEND	-163.65	-64.60	.00	.000	20.649	273.096	23.44	-10.37	100.15	.00	114.11	25.47
55	SAGBEND	-175.11	-68.78	.00	.000	19.478	285.296	22.88	-11.04	101.63	.00	115.19	25.71
56	SAGBEND	-186.65	-72.73	.00	.000	18.291	297.496	22.36	-11.68	102.93	.00	116.13	25.92
57	SAGBEND	-198.28	-76.44	.00	.000	17.090	309.696	21.86	-12.27	104.14	.00	117.00	26.12
58	SAGBEND	-209.97	-79.90	.00	.000	15.875	321.896	21.40	-12.83	105.27	.00	117.82	26.30
59	SAGBEND	-221.74	-83.11	.00	.000	14.647	334.096	20.97	-13.34	106.34	.00	118.60	26.47
60	SAGBEND	-233.58	-86.07	.00	.000	13.407	346.296	20.58	-13.82	107.35	.00	119.33	26.64
61	SAGBEND	-245.48	-88.77	.00	.000	12.156	358.496	20.22	-14.25	108.28	.00	120.01	26.79
62	SAGBEND	-257.43	-91.21	.00	.000	10.895	370.696	19.89	-14.64	109.11	.00	120.63	26.93
63	SAGBEND	-269.44	-93.38	.00	.000	9.625	382.896	19.60	-14.99	109.82	.00	121.14	27.04
64	SAGBEND	-281.49	-95.29	.00	.000	8.347	395.097	19.35	-15.30	110.35	.00	121.52	27.12
65	SAGBEND	-293.58	-96.92	.00	.000	7.065	407.297	19.13	-15.56	110.58	.00	121.65	27.15
66	SAGBEND	-305.70	-98.29	.00	.000	5.783	419.497	18.94	-15.78	110.27	.00	121.33	27.08
67	SAGBEND	-317.85	-99.38	.00	.000	4.510	431.697	18.80	-15.96	108.93	.00	120.16	26.82
68	SAGBEND	-330.02	-100.21	.00	.000	3.263	443.898	18.69	-16.09	105.53	.00	117.27	26.18
69	SAGBEND	-342.21	-100.77	.00	.000	2.078	456.098	18.62	-16.18	97.90	.00	110.81	24.73
70	SAGBEND	-354.41	-101.10	.00	.000	1.025	468.298	18.57	-16.23	81.46	.00	96.95	21.64
71	SEABED	-366.61	-101.23	.00	.000	.257	480.499	18.56	-16.25	46.53	.00	67.72	15.12
72	SEABED	-378.81	-101.25	.00	.000	-.015	492.699	18.56	-16.26	5.99	.00	34.76	7.76
73	SEABED	-391.01	-101.24	.00	.000	-.017	504.899	18.56	-16.25	-2.01	.00	31.70	7.08
74	SEABED	-403.21	-101.24	.00	.000	-.001	517.099	18.56	-16.25	-.62	.00	30.64	6.84
75	SEABED	-415.41	-101.24	.00	.000	.001	529.299	18.56	-16.25	.04	.00	30.20	6.74
76	SEABED	-427.61	-101.24	.00	.000	.000	541.499	18.56	-16.25	.04	.00	30.21	6.74
77	SEABED	-439.81	-101.24	.00	.000	.000	553.699	18.56	-16.25	.00	.00	30.18	6.74
78	SEABED	-452.01	-101.24	.00	.000	.000	565.899	18.56	-16.25	.00	.00	30.18	6.74
79	SEABED	-464.21	-101.24	.00	.000	.000	578.099	18.56	-16.25	.00	.00	30.17	6.74
80	SEABED	-476.41	-101.24	.00	.000	.000	590.299	18.56	-16.25	.00	.00	30.17	6.74
81	SEABED	-488.61	-101.24	.00	.000	.000	602.499	18.56	-16.25	.00	.00	30.17	6.74
82	SEABED	-500.81	-101.24	.00	.000	.000	614.699	18.56	-16.25	.00	.00	30.17	6.74

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	HORIZ (KN)	SUPT SEPARATIONS VERT (M)	HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	HORIZ (KN-M)	TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.47	.00	.00	.00	-1.36	-77.24	.00	77.24
5	LAYBARGE	73.45	5.65	.00	50.05	.00	.00	.00	-2.64	-67.29	.00	67.29
7	TENSIONR	60.11	5.23	.00	43.35	.00	.00	.00	402.77	-22.32	.00	22.32
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	402.39	-19.37	.00	19.37
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	401.60	-61.85	.00	61.85
11	LAYBARGE	46.45	4.79	.00	36.74	.00	.00	.00	400.85	-189.55	.00	189.55
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	400.61	-210.01	.00	210.01
14	TENSIONR	35.35	4.30	.00	73.62	.00	.00	.00	805.31	-469.33	.00	469.33
16	LAYBARGE	23.34	3.42	.00	104.89	.00	.00	.00	800.68	-762.10	.00	762.10
18	LAYBARGE	8.89	1.61	.00	103.58	.00	.00	.00	792.39	-966.43	.00	966.43
20	LAYBARGE	3.11	.61	.00	74.32	.00	.00	.00	788.66	-895.09	.00	895.09
24	STINGER	-7.61	-1.66	.00	4.67	.00	.00	.00	785.61	-518.46	.00	518.46

26	STINGER	-16.49	-3.84	.00	54.15	.00	.00	.00	782.85	-535.13	.00	535.13
29	STINGER	-26.15	-6.47	.00	.00	.00	.01	.00	780.08	-330.32	.00	330.32
32	STINGER	-34.92	-9.05	.00	25.96	.00	.00	.00	776.77	-384.98	.00	384.98
35	STINGER	-44.35	-12.01	.00	.00	.00	.02	.00	772.92	-453.61	.00	453.61
38	STINGER	-53.00	-14.98	.00	86.83	.00	.00	.00	767.99	-800.24	.00	800.24
41	STINGER	-62.17	-18.51	.00	30.18	.00	.00	.00	763.96	-716.48	.00	716.48
43	STINGER	-72.09	-22.81	.00	95.66	.00	.00	.00	758.40	-766.88	.00	766.88
45	STINGER	-74.95	-24.15	.00	.00	.00	.52	.00	757.47	-574.14	.00	574.14
47	SAGBEND	-85.85	-29.49	.00	.00	.00	.00	.00	751.72	-110.30	.00	110.30
48	SAGBEND	-96.76	-34.96	.00	.00	.00	.00	.00	744.92	101.47	.00	101.47
49	SAGBEND	-107.70	-40.36	.00	.00	.00	.00	.00	738.12	199.04	.00	199.04
50	SAGBEND	-118.71	-45.61	.00	.00	.00	.00	.00	731.53	245.29	.00	245.29
51	SAGBEND	-129.81	-50.68	.00	.00	.00	.00	.00	725.20	268.31	.00	268.31
52	SAGBEND	-141.00	-55.54	.00	.00	.00	.00	.00	719.14	280.74	.00	280.74
53	SAGBEND	-152.28	-60.18	.00	.00	.00	.00	.00	713.35	288.32	.00	288.32
54	SAGBEND	-163.65	-64.60	.00	.00	.00	.00	.00	707.85	293.68	.00	293.68
55	SAGBEND	-175.11	-68.78	.00	.00	.00	.00	.00	702.63	298.02	.00	298.02
56	SAGBEND	-186.65	-72.73	.00	.00	.00	.00	.00	697.71	301.84	.00	301.84
57	SAGBEND	-198.28	-76.44	.00	.00	.00	.00	.00	693.10	305.38	.00	305.38
58	SAGBEND	-209.97	-79.90	.00	.00	.00	.00	.00	688.79	308.70	.00	308.70
59	SAGBEND	-221.74	-83.11	.00	.00	.00	.00	.00	684.79	311.85	.00	311.85
60	SAGBEND	-233.58	-86.07	.00	.00	.00	.00	.00	681.10	314.80	.00	314.80
61	SAGBEND	-245.48	-88.77	.00	.00	.00	.00	.00	677.74	317.53	.00	317.53
62	SAGBEND	-257.43	-91.21	.00	.00	.00	.00	.00	674.70	319.98	.00	319.98
63	SAGBEND	-269.44	-93.38	.00	.00	.00	.00	.00	672.00	322.06	.00	322.06
64	SAGBEND	-281.49	-95.29	.00	.00	.00	.00	.00	669.62	323.60	.00	323.60
65	SAGBEND	-293.58	-96.92	.00	.00	.00	.00	.00	667.59	324.27	.00	324.27
66	SAGBEND	-305.70	-98.29	.00	.00	.00	.00	.00	665.89	323.36	.00	323.36
67	SAGBEND	-317.85	-99.38	.00	.00	.00	.00	.00	664.54	319.44	.00	319.44
68	SAGBEND	-330.02	-100.21	.00	.00	.00	.00	.00	663.53	309.47	.00	309.47
69	SAGBEND	-342.21	-100.77	.00	.00	.00	.00	.00	662.86	287.09	.00	287.09
70	SAGBEND	-354.41	-101.10	.00	.00	.00	.00	.00	662.52	238.87	.00	238.87
71	SEABED	-366.61	-101.23	.00	7.42	.00	.00	.00	662.47	136.45	.00	136.45
72	SEABED	-378.81	-101.25	.00	22.22	.00	.00	.00	662.52	17.55	.00	17.55
73	SEABED	-391.01	-101.24	.00	17.53	.00	.00	.00	662.52	-5.90	.00	5.90
74	SEABED	-403.21	-101.24	.00	15.06	.00	.00	.00	662.52	-1.83	.00	1.83
75	SEABED	-415.41	-101.24	.00	15.02	.00	.00	.00	662.52	.11	.00	.11
76	SEABED	-427.61	-101.24	.00	15.16	.00	.00	.00	662.52	.12	.00	.12
77	SEABED	-439.81	-101.24	.00	15.18	.00	.00	.00	662.52	.01	.00	.01
78	SEABED	-452.01	-101.24	.00	15.18	.00	.00	.00	662.52	-.01	.00	.01
79	SEABED	-464.21	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
80	SEABED	-476.41	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
81	SEABED	-488.61	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
82	SEABED	-500.81	-101.24	.00	.00	.00	.00	.00	662.52	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.32	6.28	0.00	0.000	1.574	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.28	5.96	0.00	0.000	1.571	12.04	-0.0001	0.0000	-0.0136	0.0000	0.0137	0.00
5	LAYBARGE	73.46	5.64	0.00	0.000	1.744	22.87	-0.0002	0.0000	-0.0112	0.0000	0.0113	0.00
7	TENSIONR	60.11	5.23	0.00	0.000	1.773	36.22	0.0088	0.0000	-0.0037	0.0000	0.0124	0.00
9	LAYBARGE	57.09	5.14	0.00	0.000	1.806	39.25	0.0088	0.0000	-0.0033	0.0000	0.0120	0.00
10	LAYBARGE	51.10	4.95	0.00	0.000	1.861	45.24	0.0087	0.0000	-0.0106	0.0000	0.0192	0.00
11	LAYBARGE	46.45	4.79	0.00	0.000	2.047	49.89	0.0087	0.0000	-0.0318	0.0000	0.0403	0.00
13	LAYBARGE	44.92	4.73	0.00	0.000	2.149	51.42	0.0087	0.0000	-0.0350	0.0000	0.0436	0.00
14	TENSIONR	35.37	4.30	0.00	0.000	3.171	60.99	0.0168	0.0000	-0.0778	0.0000	0.0944	0.00
16	LAYBARGE	23.35	3.42	0.00	0.000	5.442	73.04	0.0167	0.0000	-0.1342	0.0000	0.1496	0.00
18	LAYBARGE	8.90	1.61	0.00	0.000	8.889	87.61	0.0166	0.0000	-0.1656	0.0000	0.1820	0.00
20	LAYBARGE	3.12	0.61	0.00	0.000	10.490	93.47	0.0165	0.0000	-0.2563	0.0000	0.2709	0.00
24	STINGER	-7.61	-1.65	0.00	0.000	13.190	104.43	0.0164	-0.0001	-0.1393	0.0000	0.1544	0.00
26	STINGER	-16.48	-3.89	0.00	0.000	14.951	113.57	0.0163	-0.0003	-0.1844	0.0000	0.1994	0.00
29	STINGER	-26.08	-6.61	0.00	0.000	16.109	123.59	0.0162	-0.0005	-0.0959	0.0000	0.1106	0.00
32	STINGER	-34.85	-9.25	0.00	0.000	17.053	132.74	0.0160	-0.0007	-0.1214	0.0000	0.1375	0.00
35	STINGER	-44.35	-12.16	0.00	0.000	18.068	142.65	0.0158	-0.0010	-0.1832	0.0000	0.1992	0.00
38	STINGER	-52.99	-15.11	0.00	0.000	19.899	151.79	0.0157	-0.0012	-0.1806	0.0000	0.1963	0.00
41	STINGER	-62.18	-18.67	0.00	0.000	22.212	161.62	0.0155	-0.0015	-0.1927	-0.0001	0.2069	0.00
43	STINGER	-72.08	-22.99	0.00	0.000	24.828	172.43	0.0152	-0.0018	-0.1658	0.0003	0.1800	0.00
45	STINGER	-74.93	-24.33	0.00	0.000	25.497	175.57	0.0151	-0.0019	-0.1286	0.0003	0.1430	0.00
47	SAGBEND	-85.81	-29.68	0.00	0.000	26.686	187.70	0.0148	-0.0023	-0.0398	-0.0001	0.0543	0.00
48	SAGBEND	-96.70	-35.15	0.00	0.000	26.664	199.90	0.0145	-0.0028	0.0356	-0.0001	0.0502	0.00
49	SAGBEND	-107.64	-40.55	0.00	0.000	25.984	212.10	0.0142	-0.0032	0.0507	-0.0001	0.0645	0.00
50	SAGBEND	-118.65	-45.80	0.00	0.000	25.045	224.30	0.0139	-0.0036	0.0596	-0.0001	0.0731	0.00
51	SAGBEND	-129.75	-50.86	0.00	0.000	24.034	236.50	0.0136	-0.0040	0.0637	-0.0001	0.0778	0.00
52	SAGBEND	-140.95	-55.73	0.00	0.000	22.891	248.70	0.0133	-0.0044	0.0658	0.0002	0.0796	0.00
53	SAGBEND	-152.24	-60.34	0.00	-0.001	21.685	260.90	0.0130	-0.0047	0.0626	0.0002	0.0757	0.00
54	SAGBEND	-163.61	-64.74	0.00	0.000	20.503	273.10	0.0128	-0.0051	0.0625	0.0001	0.0770	0.00
55	SAGBEND	-175.06	-68.92	0.00	0.001	19.382	285.30	0.0125	-0.0054	0.0628	-0.0001	0.0773	0.00
56	SAGBEND	-186.60	-72.87	0.00	0.001	18.265	297.50	0.0123	-0.0057	0.0629	-0.0001	0.0766	0.00
57	SAGBEND	-198.23	-76.60	0.00	0.001	17.022	309.70	0.0121	-0.0060	0.0630	-0.0002	0.0771	0.00
58	SAGBEND	-209.93	-80.08	0.00	0.000	15.820	321.90	0.0119	-0.0063	0.0661	-0.0002	0.0803	0.00
59	SAGBEND	-221.71	-83.29	0.00	0.000	14.602	334.10	0.0117	-0.0065	0.0672	-0.0002	0.0819	0.00
60	SAGBEND	-233.55	-86.21	0.00	-0.001	13.288	346.30	0.0115	-0.0067	0.0667	-0.0002	0.0807	0.00
61	SAGBEND	-245.46	-88.88	0.00	-0.001	12.000	358.50	0.0114	-0.0069	0.0664	-0.0002	0.0807	0.00
62	SAGBEND	-257.42	-91.27	0.00	-0.001	10.720	370.70	0.0113	-0.0071	0.0633	-0.0001	0.0777	0.00
63	SAGBEND	-269.43	-93.46	0.00	0.000	9.484	382.90	0.0111	-0.0073	0.0651	-0.0001	0.0785	0.00
64	SAGBEND	-281.48	-95.37	0.00	0.000	8.275	395.10	0.0110	-0.0074	0.0657	0.0001	0.0784	0.00
65	SAGBEND	-293.57	-96.99	0.00	0.001	7.081	407.30	0.0110	-0.0076	0.0634	0.0002	0.0773	0.00

66	SAGBEND	-305.69	-98.35	0.00	0.001	5.756	419.49	0.0109	-0.0077	0.0676	-0.0002	0.0809	0.00
67	SAGBEND	-317.85	-99.46	0.00	0.000	4.464	431.69	0.0108	-0.0077	0.0697	-0.0002	0.0832	0.00
68	SAGBEND	-330.02	-100.28	0.00	0.000	3.246	443.89	0.0108	-0.0078	0.0676	-0.0002	0.0797	0.00
69	SAGBEND	-342.20	-100.80	0.00	0.000	1.978	456.09	0.0108	-0.0078	0.0601	-0.0001	0.0744	0.00
70	SAGBEND	-354.40	-101.09	0.00	-0.001	0.935	468.29	0.0108	-0.0079	0.0480	0.0002	0.0622	0.00
71	SAGBEND	-366.60	-101.23	0.00	-0.001	0.359	480.49	0.0108	-0.0079	0.0303	0.0002	0.0439	0.00
72	SEABED	-378.80	-101.27	0.00	-0.001	0.064	492.69	0.0108	-0.0079	0.0150	0.0001	0.0294	0.00
73	SEABED	-391.00	-101.27	0.00	0.000	-0.023	504.89	0.0109	-0.0079	0.0032	0.0001	0.0182	0.00
74	SEABED	-403.20	-101.27	0.00	0.000	-0.012	517.09	0.0109	-0.0079	-0.0012	0.0000	0.0169	0.00
75	SEABED	-415.40	-101.27	0.00	0.000	-0.003	529.29	0.0109	-0.0079	-0.0006	0.0000	0.0166	0.00
76	SEABED	-427.60	-101.27	0.00	0.000	0.001	541.49	0.0109	-0.0079	-0.0002	0.0000	0.0164	0.00
77	SEABED	-439.80	-101.27	0.00	0.000	0.000	553.69	0.0109	-0.0079	0.0001	0.0000	0.0164	0.00
78	SEABED	-452.00	-101.27	0.00	0.000	0.000	565.89	0.0110	-0.0079	0.0000	0.0000	0.0164	0.00

MAXIMUM DYNAMIC PIPE FORCES AND STRAINS

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.32	6.28	0.00	16.83	0.00	0.00	0.00	0.00	4.65	0.00	4.65
3	LAYBARGE	84.28	5.96	0.00	57.21	0.00	0.00	0.00	-5.36	-82.84	0.00	82.84
5	LAYBARGE	73.46	5.64	0.00	50.50	0.00	0.00	0.00	-10.24	-68.16	0.00	68.16
7	TENSIONR	60.11	5.23	0.00	43.79	0.01	0.00	0.00	445.46	-22.70	0.00	22.70
9	LAYBARGE	57.09	5.14	0.00	0.00	0.00	0.00	0.00	445.31	-20.07	0.00	20.07
10	LAYBARGE	51.10	4.95	0.00	0.00	0.00	0.00	0.00	444.93	-64.27	-0.02	64.27
11	LAYBARGE	46.45	4.79	0.00	38.95	-0.01	0.00	0.00	444.46	-193.09	-0.02	193.09
13	LAYBARGE	44.92	4.73	0.00	0.00	0.00	0.00	0.00	444.30	-212.64	-0.03	212.64
14	TENSIONR	35.37	4.30	0.00	76.43	0.00	0.00	0.00	854.89	-472.48	-0.08	472.48
16	LAYBARGE	23.35	3.42	0.00	129.72	0.01	0.00	0.00	851.45	-814.42	-0.12	814.42
18	LAYBARGE	8.90	1.61	0.00	156.20	0.01	0.01	0.00	845.48	-1005.29	-0.16	1005.29
20	LAYBARGE	3.12	0.61	0.00	241.27	0.02	0.05	0.00	839.99	-1441.06	0.17	1441.06
24	STINGER	-7.61	-1.65	0.00	132.34	0.02	0.33	0.00	840.02	-845.66	-0.13	845.66
26	STINGER	-16.48	-3.89	0.00	175.40	0.02	0.93	0.00	838.61	-1118.33	0.16	1118.33
29	STINGER	-26.08	-6.61	0.00	86.19	0.01	0.89	0.00	836.49	-581.85	0.10	581.85
32	STINGER	-34.85	-9.25	0.00	146.14	-0.02	0.76	0.00	833.96	-737.11	0.11	737.11
35	STINGER	-44.35	-12.16	0.00	181.59	-0.03	0.73	0.00	829.97	-1111.46	0.14	1111.46
38	STINGER	-52.99	-15.11	0.00	165.15	0.09	0.20	0.00	828.01	-1095.62	0.16	1095.62
41	STINGER	-62.18	-18.67	0.00	162.33	-0.32	0.01	0.00	824.94	-1168.15	-0.66	1168.15
43	STINGER	-72.08	-22.99	0.00	138.94	0.41	0.00	0.00	820.94	-1006.18	1.97	1006.18
45	STINGER	-74.93	-24.33	0.00	0.00	0.00	0.55	0.00	820.26	-780.44	1.60	780.44
47	SAGBEND	-85.81	-29.68	0.00	0.00	0.00	0.00	0.00	815.89	-241.63	-0.77	241.63
48	SAGBEND	-96.70	-35.15	0.00	0.00	0.00	0.00	0.00	810.65	216.03	-0.79	216.03
49	SAGBEND	-107.64	-40.55	0.00	0.00	0.00	0.00	0.00	805.36	307.88	-0.91	307.88
50	SAGBEND	-118.65	-45.80	0.00	0.00	0.00	0.00	0.00	800.19	361.50	-0.90	361.50
51	SAGBEND	-129.75	-50.86	0.00	0.00	0.00	0.00	0.00	795.17	386.95	-0.89	386.95
52	SAGBEND	-140.95	-55.73	0.00	0.00	0.00	0.00	0.00	790.30	399.16	0.94	399.16
53	SAGBEND	-152.24	-60.34	0.00	0.00	0.00	0.00	0.00	785.65	380.12	0.93	380.12
54	SAGBEND	-163.61	-64.74	0.00	0.00	0.00	0.00	0.00	781.27	379.29	0.71	379.29
55	SAGBEND	-175.06	-68.92	0.00	0.00	0.00	0.00	0.00	777.22	381.30	-0.65	381.31
56	SAGBEND	-186.60	-72.87	0.00	0.00	0.00	0.00	0.00	773.50	381.56	-0.73	381.56
57	SAGBEND	-198.23	-76.60	0.00	0.00	0.00	0.00	0.00	770.09	382.28	-0.96	382.28
58	SAGBEND	-209.93	-80.08	0.00	0.00	0.00	0.00	0.00	767.04	401.48	-1.25	401.48
59	SAGBEND	-221.71	-83.29	0.00	0.00	0.00	0.00	0.00	764.38	407.64	-1.22	407.64
60	SAGBEND	-233.55	-86.21	0.00	0.00	0.00	0.00	0.00	762.12	404.79	-1.11	404.79
61	SAGBEND	-245.46	-88.88	0.00	0.00	0.00	0.00	0.00	760.19	403.14	-1.06	403.14
62	SAGBEND	-257.42	-91.27	0.00	0.00	0.00	0.00	0.00	758.50	384.50	-0.74	384.50
63	SAGBEND	-269.43	-93.46	0.00	0.00	0.00	0.00	0.00	757.03	395.11	-0.61	395.11
64	SAGBEND	-281.48	-95.37	0.00	0.00	0.00	0.00	0.00	755.80	398.90	0.79	398.90
65	SAGBEND	-293.57	-96.99	0.00	0.00	0.00	0.00	0.00	754.86	384.60	0.98	384.60
66	SAGBEND	-305.69	-98.35	0.00	0.00	0.00	0.00	0.00	754.30	410.54	-1.19	410.54
67	SAGBEND	-317.85	-99.46	0.00	0.00	0.00	0.00	0.00	754.13	422.96	-1.21	422.96
68	SAGBEND	-330.02	-100.28	0.00	0.00	0.00	0.00	0.00	754.51	410.32	-1.12	410.32
69	SAGBEND	-342.20	-100.80	0.00	0.02	0.04	0.00	0.00	755.16	364.84	-0.85	364.84
70	SAGBEND	-354.40	-101.09	0.00	9.49	0.16	0.00	0.00	756.03	291.56	0.99	291.56
71	SAGBEND	-366.60	-101.23	0.00	22.76	0.23	0.00	0.00	757.09	183.66	1.27	183.66
72	SEABED	-378.80	-101.27	0.00	24.37	0.13	0.00	0.00	758.26	91.34	0.87	91.34
73	SEABED	-391.00	-101.27	0.00	19.52	-0.03	0.00	0.00	759.37	19.67	0.35	19.67
74	SEABED	-403.20	-101.27	0.00	17.04	-0.02	0.00	0.00	760.43	-7.46	-0.06	7.46
75	SEABED	-415.40	-101.27	0.00	15.63	-0.01	0.00	0.00	761.44	-3.46	-0.05	3.46
76	SEABED	-427.60	-101.27	0.00	15.30	0.00	0.00	0.00	762.40	-1.21	-0.02	1.21
77	SEABED	-439.80	-101.27	0.00	15.27	0.01	0.00	0.00	763.32	0.40	-0.03	0.40
78	SEABED	-452.00	-101.27	0.00	0.00	0.00	0.00	0.00	764.18	0.00	0.00	0.00

Water Depth 101 m (45°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.96	.00	19.62	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	16.39	.00	-7.58	-.01	22.83	5.10
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	16.37	.00	-6.61	.00	21.99	4.91
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	16.34	.00	-21.19	.00	34.35	7.67
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	16.31	.00	-64.79	.00	71.38	15.93
13	LAYBARGE	44.91	4.73	.00	.000	2.151	51.425	16.30	.00	-71.67	.00	77.21	17.24
14	TENSIONR	35.35	4.30	.00	.000	3.172	60.993	32.76	.00	-159.58	-.02	168.40	37.59
16	LAYBARGE	23.34	3.42	.00	.000	5.435	73.039	32.57	.00	-262.39	.00	255.61	57.06
18	LAYBARGE	8.89	1.61	.00	.000	8.923	87.606	32.24	.00	-319.49	.01	303.81	67.82
20	LAYBARGE	3.11	.61	.00	.000	10.804	93.474	32.04	.00	-369.71	-.13	346.30	77.30
24	STINGER	-7.60	-1.74	.00	-.002	13.707	104.441	31.79	-.28	-223.91	-.84	222.26	49.61
26	STINGER	-16.45	-4.04	.00	-.006	15.354	113.585	31.51	-.65	-172.40	-.66	178.38	39.82
29	STINGER	-26.08	-6.81	.00	-.008	16.549	123.605	31.16	-1.09	-94.53	-.55	112.06	25.01
32	STINGER	-34.83	-9.47	.00	-.012	17.343	132.749	30.80	-1.52	-99.38	-.77	116.05	25.90
35	STINGER	-44.25	-12.50	.01	-.010	18.393	142.648	30.39	-2.01	-138.46	.43	149.09	33.28
38	STINGER	-52.89	-15.50	.01	-.024	20.073	151.793	29.94	-2.49	-265.11	-4.02	256.56	57.27
41	STINGER	-62.05	-19.06	.01	.024	22.340	161.621	29.47	-3.06	-242.89	13.06	237.77	53.07
43	STINGER	-71.96	-23.38	.01	-.175	24.759	172.430	28.89	-3.75	-254.73	-50.96	251.60	56.16
45	STINGER	-74.79	-24.70	.02	-.323	25.418	175.557	28.74	-3.97	-190.56	-40.28	196.31	43.82
47	SAGBEND	-85.69	-30.05	.12	-.642	26.601	187.696	28.06	-4.83	-34.84	-13.10	62.25	13.90
48	SAGBEND	-96.59	-35.52	.25	-.721	26.539	199.896	27.33	-5.70	36.32	-.74	61.26	13.67
49	SAGBEND	-107.53	-40.92	.39	-.690	25.903	212.096	26.61	-6.57	69.15	4.72	88.99	19.86
50	SAGBEND	-118.55	-46.17	.52	-.613	24.999	224.296	25.91	-7.41	84.74	7.00	102.09	22.79
51	SAGBEND	-129.65	-51.22	.63	-.517	23.966	236.496	25.23	-8.22	92.52	7.76	108.50	24.22
52	SAGBEND	-140.84	-56.07	.72	-.418	22.866	248.696	24.58	-9.00	96.72	7.75	111.83	24.96
53	SAGBEND	-152.13	-60.70	.79	-.322	21.728	260.896	23.96	-9.75	99.28	7.40	113.77	25.39
54	SAGBEND	-163.51	-65.10	.84	-.233	20.565	273.096	23.38	-10.45	101.08	6.92	115.08	25.69
55	SAGBEND	-174.97	-69.27	.88	-.150	19.384	285.296	22.82	-11.12	102.52	6.41	116.09	25.91
56	SAGBEND	-186.52	-73.20	.91	-.074	18.187	297.496	22.30	-11.75	103.79	5.92	116.98	26.11
57	SAGBEND	-198.15	-76.88	.91	-.005	16.976	309.696	21.80	-12.34	104.95	5.46	117.79	26.29
58	SAGBEND	-209.86	-80.32	.91	.059	15.752	321.896	21.34	-12.90	106.04	5.05	118.55	26.46
59	SAGBEND	-221.64	-83.51	.89	.117	14.515	334.096	20.92	-13.41	107.06	4.67	119.27	26.62
60	SAGBEND	-233.48	-86.44	.86	.171	13.268	346.296	20.53	-13.88	108.01	4.33	119.95	26.77
61	SAGBEND	-245.38	-89.11	.82	.221	12.009	358.496	20.17	-14.31	108.88	4.03	120.57	26.91
62	SAGBEND	-257.34	-91.51	.77	.267	10.741	370.696	19.85	-14.69	109.65	3.76	121.13	27.04
63	SAGBEND	-269.35	-93.65	.71	.310	9.465	382.896	19.56	-15.04	110.30	3.51	121.58	27.14
64	SAGBEND	-281.41	-95.52	.64	.350	8.183	395.096	19.31	-15.34	110.74	3.26	121.88	27.21
65	SAGBEND	-293.50	-97.12	.56	.386	6.897	407.297	19.10	-15.59	110.86	2.96	121.91	27.21
66	SAGBEND	-305.63	-98.45	.47	.419	5.612	419.497	18.92	-15.81	110.40	2.55	121.46	27.11
67	SAGBEND	-317.78	-99.51	.38	.445	4.339	431.697	18.78	-15.98	108.80	1.84	120.07	26.80
68	SAGBEND	-329.96	-100.30	.29	.459	3.096	443.897	18.68	-16.10	104.94	.49	116.76	26.06
69	SAGBEND	-342.15	-100.83	.19	.451	1.922	456.098	18.61	-16.19	96.38	-2.27	109.55	24.45
70	SAGBEND	-354.34	-101.13	.10	.395	.896	468.298	18.57	-16.24	78.07	-8.03	94.45	21.08
71	SEABED	-366.54	-101.24	.03	.244	.188	480.499	18.56	-16.25	39.46	-19.01	65.45	14.61
72	SEABED	-378.74	-101.25	.00	.040	-.023	492.699	18.56	-16.26	3.33	-10.57	38.76	8.65
73	SEABED	-390.94	-101.24	.00	-.009	-.014	504.899	18.56	-16.25	-1.93	-.27	31.65	7.07
74	SEABED	-403.14	-101.24	.00	-.003	.000	517.099	18.56	-16.25	-.45	.58	30.73	6.86
75	SEABED	-415.34	-101.24	.00	.000	.001	529.299	18.56	-16.25	.06	.09	30.25	6.75
76	SEABED	-427.54	-101.24	.00	.000	.000	541.499	18.56	-16.25	.03	-.02	30.21	6.74
77	SEABED	-439.74	-101.24	.00	.000	.000	553.699	18.56	-16.25	.00	-.01	30.18	6.74
78	SEABED	-451.94	-101.24	.00	.000	.000	565.899	18.56	-16.25	.00	.00	30.18	6.74
79	SEABED	-464.14	-101.24	.00	.000	.000	578.099	18.56	-16.25	.00	.00	30.17	6.74
80	SEABED	-476.34	-101.24	.00	.000	.000	590.299	18.56	-16.25	.00	.00	30.17	6.74
81	SEABED	-488.54	-101.24	.00	.000	.000	602.499	18.56	-16.25	.00	.00	30.17	6.74
82	SEABED	-500.74	-101.24	.00	.000	.000	614.699	18.56	-16.25	.00	.00	30.17	6.74

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.47	.00	.00	.00	-1.36	-77.24	.00	77.24
5	LAYBARGE	73.45	5.65	.00	50.07	.00	.00	.00	-2.64	-67.32	.00	67.32
7	TENSIONR	60.11	5.23	.00	43.29	.05	.00	.00	402.79	-22.22	-.04	22.22
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	402.41	-19.37	.00	19.37
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	401.62	-62.13	.00	62.13
11	LAYBARGE	46.45	4.79	.00	37.03	.00	.00	.00	400.87	-189.99	.00	189.99
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	400.63	-210.16	.00	210.16
14	TENSIONR	35.35	4.30	.00	72.52	.08	.00	.00	805.33	-467.96	-.06	467.96
16	LAYBARGE	23.34	3.42	.00	108.44	.00	.00	.00	800.67	-769.47	.00	769.47
18	LAYBARGE	8.89	1.61	.00	63.29	.07	.00	.00	792.57	-936.91	.02	936.91
20	LAYBARGE	3.11	.61	.00	122.14	-.40	.00	.00	787.61	-1084.17	-.39	1084.17
24	STINGER	-7.60	-1.74	.00	23.60	-1.38	.00	.00	785.07	-656.61	-2.46	656.61

26	STINGER	-16.45	-4.04	.00	37.91	-1.21	.00	.00	782.71	-505.57	-1.93	505.57
29	STINGER	-26.08	-6.81	.00	.00	-1.12	.00	.00	779.77	-277.21	-1.60	277.21
32	STINGER	-34.83	-9.47	.00	13.80	-1.63	.00	.00	776.44	-291.44	-2.24	291.45
35	STINGER	-44.25	-12.50	.01	.00	.61	.03	.00	772.44	-406.02	1.27	406.02
38	STINGER	-52.89	-15.50	.01	86.81	-7.75	.00	.00	767.46	-777.43	-11.79	777.52
41	STINGER	-62.05	-19.06	.01	33.17	21.18	.00	.00	763.31	-712.26	38.30	713.29
43	STINGER	-71.96	-23.38	.01	92.77	-31.49	.00	.00	757.74	-746.99	-149.43	761.79
45	STINGER	-74.79	-24.70	.02	.00	.00	.52	.01	756.81	-558.83	-118.11	571.17
47	SAGBEND	-85.69	-30.05	.12	.00	.00	.00	.00	751.04	-102.16	-38.42	109.15
48	SAGBEND	-96.59	-35.52	.25	.00	.00	.00	.00	744.24	106.51	-2.16	106.53
49	SAGBEND	-107.53	-40.92	.39	.00	.00	.00	.00	737.44	202.78	13.83	203.25
50	SAGBEND	-118.55	-46.17	.52	.00	.00	.00	.00	730.86	248.51	20.53	249.35
51	SAGBEND	-129.65	-51.22	.63	.00	.00	.00	.00	724.54	271.32	22.76	272.27
52	SAGBEND	-140.84	-56.07	.72	.00	.00	.00	.00	718.49	283.63	22.74	284.54
53	SAGBEND	-152.13	-60.70	.79	.00	.00	.00	.00	712.72	291.13	21.70	291.93
54	SAGBEND	-163.51	-65.10	.84	.00	.00	.00	.00	707.23	296.41	20.29	297.10
55	SAGBEND	-174.97	-69.27	.88	.00	.00	.00	.00	702.04	300.64	18.80	301.23
56	SAGBEND	-186.52	-73.20	.91	.00	.00	.00	.00	697.15	304.35	17.36	304.85
57	SAGBEND	-198.15	-76.88	.91	.00	.00	.00	.00	692.56	307.76	16.02	308.18
58	SAGBEND	-209.86	-80.32	.91	.00	.00	.00	.00	688.28	310.95	14.80	311.30
59	SAGBEND	-221.64	-83.51	.89	.00	.00	.00	.00	684.31	313.94	13.70	314.24
60	SAGBEND	-233.48	-86.44	.86	.00	.00	.00	.00	680.66	316.74	12.71	316.99
61	SAGBEND	-245.38	-89.11	.82	.00	.00	.00	.00	677.34	319.29	11.83	319.51
62	SAGBEND	-257.34	-91.51	.77	.00	.00	.00	.00	674.34	321.56	11.03	321.75
63	SAGBEND	-269.35	-93.65	.71	.00	.00	.00	.00	671.67	323.44	10.30	323.61
64	SAGBEND	-281.41	-95.52	.64	.00	.00	.00	.00	669.34	324.75	9.55	324.89
65	SAGBEND	-293.50	-97.12	.56	.00	.00	.00	.00	667.35	325.10	8.69	325.22
66	SAGBEND	-305.63	-98.45	.47	.00	.00	.00	.00	665.70	323.74	7.48	323.83
67	SAGBEND	-317.78	-99.51	.38	.00	.00	.00	.00	664.39	319.07	5.41	319.11
68	SAGBEND	-329.96	-100.30	.29	.00	.00	.00	.00	663.43	307.72	1.44	307.72
69	SAGBEND	-342.15	-100.83	.19	.00	.00	.00	.00	662.81	282.64	-6.64	282.72
70	SAGBEND	-354.34	-101.13	.10	.01	-.03	.00	.00	662.52	228.93	-23.55	230.14
71	SEABED	-366.54	-101.24	.03	10.35	-7.43	.00	.00	662.49	115.70	-55.75	128.43
72	SEABED	-378.74	-101.25	.00	22.06	-1.50	.00	.00	662.52	9.76	-30.99	32.50
73	SEABED	-390.94	-101.24	.00	16.91	2.18	.00	.00	662.52	-5.67	-.78	5.73
74	SEABED	-403.14	-101.24	.00	14.99	.36	.00	.00	662.52	-1.33	1.71	2.17
75	SEABED	-415.34	-101.24	.00	15.05	-.08	.00	.00	662.52	.17	.25	.30
76	SEABED	-427.54	-101.24	.00	15.17	-.03	.00	.00	662.52	.10	-.07	.12
77	SEABED	-439.74	-101.24	.00	15.18	.00	.00	.00	662.52	.00	-.02	.02
78	SEABED	-451.94	-101.24	.00	15.18	.00	.00	.00	662.52	-.01	.00	.01
79	SEABED	-464.14	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
80	SEABED	-476.34	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
81	SEABED	-488.54	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
82	SEABED	-500.74	-101.24	.00	.00	.00	.00	.00	662.52	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.31	6.29	0.00	-0.001	1.574	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.28	5.96	0.00	0.000	1.572	12.04	-0.0001	0.0000	-0.0136	-0.0001	0.0137	0.00
5	LAYBARGE	73.45	5.65	0.00	0.000	1.744	22.87	-0.0002	0.0000	-0.0113	0.0000	0.0114	0.00
7	TENSIONR	60.10	5.24	0.00	0.000	1.774	36.22	0.0087	0.0000	-0.0038	0.0000	0.0124	0.00
9	LAYBARGE	57.08	5.15	0.00	0.000	1.807	39.25	0.0087	0.0000	-0.0033	0.0000	0.0120	0.00
10	LAYBARGE	51.09	4.95	0.00	0.000	1.863	45.24	0.0087	0.0000	-0.0107	0.0002	0.0192	0.00
11	LAYBARGE	46.45	4.80	0.00	0.001	2.049	49.89	0.0087	0.0000	-0.0319	0.0002	0.0405	0.00
13	LAYBARGE	44.91	4.74	0.00	0.001	2.151	51.42	0.0087	0.0000	-0.0350	0.0003	0.0436	0.00
14	TENSIONR	35.36	4.31	0.00	0.003	3.175	60.99	0.0168	0.0000	-0.0780	0.0008	0.0945	0.00
16	LAYBARGE	23.35	3.42	0.00	0.003	5.436	73.04	0.0168	0.0000	-0.1338	0.0012	0.1500	0.00
18	LAYBARGE	8.89	1.62	0.00	0.002	8.885	87.61	0.0166	0.0000	-0.1660	0.0015	0.1823	0.00
20	LAYBARGE	3.11	0.61	0.00	-0.003	10.491	93.47	0.0166	0.0000	-0.2704	-0.0029	0.2859	0.00
24	STINGER	-7.61	-1.62	0.00	-0.004	13.092	104.43	0.0165	-0.0001	-0.1298	-0.0023	0.1455	0.00
26	STINGER	-16.48	-3.79	0.00	-0.006	14.680	113.57	0.0164	-0.0003	-0.1861	-0.0017	0.2020	0.00
29	STINGER	-26.11	-6.47	0.00	0.000	15.811	123.59	0.0162	-0.0005	-0.1035	-0.0013	0.1195	0.00
32	STINGER	-34.87	-9.04	0.00	-0.002	16.742	132.73	0.0161	-0.0007	-0.1242	-0.0012	0.1391	0.00
35	STINGER	-44.37	-11.93	0.01	-0.003	17.859	142.64	0.0159	-0.0010	-0.1883	0.0019	0.2043	0.00
38	STINGER	-53.04	-14.85	0.01	-0.026	19.685	151.78	0.0157	-0.0012	-0.1867	-0.0040	0.2024	0.00
41	STINGER	-62.24	-18.40	0.02	0.025	22.126	161.62	0.0155	-0.0014	-0.1896	0.0147	0.2041	0.00
43	STINGER	-72.16	-22.71	0.02	-0.187	24.953	172.43	0.0152	-0.0018	-0.1672	-0.0527	0.1877	0.00
45	STINGER	-75.00	-24.04	0.03	-0.369	25.605	175.57	0.0151	-0.0019	-0.1290	-0.0415	0.1475	0.00
47	SAGBEND	-85.88	-29.43	0.14	-0.744	26.798	187.70	0.0148	-0.0023	-0.0356	-0.0187	0.0515	0.00
48	SAGBEND	-96.78	-34.92	0.28	-0.834	26.761	199.90	0.0145	-0.0027	0.0353	-0.0109	0.0500	0.00
49	SAGBEND	-107.71	-40.35	0.44	-0.813	26.121	212.10	0.0141	-0.0032	0.0504	0.0116	0.0641	0.00
50	SAGBEND	-118.71	-45.64	0.57	-0.721	25.177	224.30	0.0138	-0.0036	0.0575	0.0130	0.0725	0.00
51	SAGBEND	-129.79	-50.70	0.69	-0.586	24.087	236.50	0.0135	-0.0040	0.0620	0.0121	0.0764	0.00
52	SAGBEND	-140.97	-55.56	0.81	-0.471	22.991	248.70	0.0132	-0.0043	0.0619	0.0133	0.0763	0.00
53	SAGBEND	-152.25	-60.22	0.90	-0.371	21.864	260.90	0.0129	-0.0047	0.0615	0.0131	0.0761	0.00
54	SAGBEND	-163.61	-64.64	0.95	-0.267	20.693	273.10	0.0126	-0.0050	0.0606	0.0124	0.0748	0.00
55	SAGBEND	-175.06	-68.84	0.99	-0.193	19.519	285.30	0.0123	-0.0054	0.0621	0.0109	0.0758	0.00
56	SAGBEND	-186.60	-72.81	1.01	-0.086	18.337	297.50	0.0121	-0.0057	0.0617	0.0101	0.0759	0.00
57	SAGBEND	-198.23	-76.53	1.02	0.013	17.113	309.70	0.0119	-0.0060	0.0639	0.0093	0.0772	0.00
58	SAGBEND	-209.92	-80.00	1.02	0.047	15.894	321.90	0.0117	-0.0062	0.0655	0.0089	0.0801	0.00
59	SAGBEND	-221.69	-83.22	1.00	0.076	14.598	334.10	0.0115	-0.0065	0.0657	0.0085	0.0803	0.00
60	SAGBEND	-233.52	-86.15	0.98	0.155	13.326	346.30	0.0113	-0.0067	0.0646	0.0103	0.0785	0.00
61	SAGBEND	-245.43	-88.84	0.95	0.258	12.056	358.50	0.0111	-0.0069	0.0632	0.0119	0.0775	0.00
62	SAGBEND	-257.39	-91.27	0.90	0.264	10.796	370.70	0.0110	-0.0071	0.0626	0.0118	0.0763	0.00
63	SAGBEND	-269.39	-93.38	0.83	0.337	9.520	382.90	0.0109	-0.0073	0.0626	0.0103	0.0776	0.00
64	SAGBEND	-281.44	-95.27	0.74	0.436	8.306	395.10	0.0108	-0.0074	0.0640	0.0082	0.0782	0.00
65	SAGBEND	-293.54	-96.92	0.66	0.482	7.042	407.30	0.0107	-0.0076	0.0631	0.0070	0.0769	0.00

66	SAGBEND	-305.66	-98.32	0.57	0.520	5.747	419.49	0.0106	-0.0077	0.0654	0.0073	0.0793	0.00
67	SAGBEND	-317.81	-99.42	0.48	0.511	4.533	431.69	0.0106	-0.0077	0.0669	-0.0078	0.0809	0.00
68	SAGBEND	-329.98	-100.23	0.38	0.522	3.259	443.89	0.0105	-0.0078	0.0640	-0.0092	0.0782	0.00
69	SAGBEND	-342.17	-100.77	0.27	0.535	2.009	456.09	0.0105	-0.0078	0.0564	-0.0093	0.0706	0.00
70	SAGBEND	-354.36	-101.09	0.18	0.455	1.001	468.29	0.0105	-0.0079	0.0468	-0.0120	0.0601	0.00
71	SAGBEND	-366.56	-101.23	0.09	0.359	0.376	480.49	0.0106	-0.0079	0.0312	-0.0164	0.0456	0.00
72	SEABED	-378.76	-101.27	0.03	0.203	0.062	492.69	0.0106	-0.0079	0.0150	-0.0146	0.0307	0.00
73	SEABED	-390.96	-101.27	0.00	0.063	-0.029	504.89	0.0106	-0.0079	0.0027	-0.0090	0.0234	0.00
74	SEABED	-403.16	-101.27	0.00	-0.004	-0.014	517.09	0.0106	-0.0079	-0.0011	-0.0027	0.0173	0.00
75	SEABED	-415.36	-101.27	0.00	-0.005	-0.003	529.29	0.0106	-0.0079	-0.0006	0.0005	0.0164	0.00
76	SEABED	-427.56	-101.27	0.00	-0.002	0.000	541.49	0.0107	-0.0079	-0.0002	0.0003	0.0162	0.00
77	SEABED	-439.76	-101.27	0.00	0.000	0.001	553.70	0.0107	-0.0079	0.0000	0.0001	0.0161	0.00
78	SEABED	-451.96	-101.27	0.00	0.000	0.000	565.90	0.0107	-0.0079	0.0000	0.0000	0.0161	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.29	0.00	16.95	-0.24	0.00	0.00	0.00	4.68	0.07	4.68
3	LAYBARGE	84.28	5.96	0.00	57.34	-0.50	0.00	0.00	-4.87	-82.82	-0.44	82.82
5	LAYBARGE	73.45	5.65	0.00	50.99	0.30	0.00	0.00	-9.31	-68.44	-0.28	68.44
7	TENSIONR	60.10	5.24	0.00	44.51	0.53	0.00	0.00	444.55	-22.93	-0.18	22.93
9	LAYBARGE	57.08	5.15	0.00	0.00	0.00	0.00	0.00	444.42	-20.10	0.20	20.10
10	LAYBARGE	51.09	4.95	0.00	0.00	0.00	0.00	0.00	444.12	-64.81	1.01	64.81
11	LAYBARGE	46.45	4.80	0.00	38.86	0.35	0.00	0.00	443.76	-193.41	1.40	193.41
13	LAYBARGE	44.91	4.74	0.00	0.00	0.00	0.00	0.00	443.64	-212.71	1.86	212.71
14	TENSIONR	35.36	4.31	0.00	76.69	0.30	0.00	0.00	855.94	-473.28	4.80	473.28
16	LAYBARGE	23.35	3.42	0.00	128.94	0.90	0.00	0.00	853.01	-811.97	7.22	811.97
18	LAYBARGE	8.89	1.62	0.00	160.94	2.56	0.01	0.00	846.69	-1007.57	9.21	1007.58
20	LAYBARGE	3.11	0.61	0.00	245.04	-4.06	0.05	0.00	843.84	-1470.35	-17.44	1470.37
24	STINGER	-7.61	-1.62	0.00	121.17	-7.15	0.45	0.00	841.46	-787.94	-14.24	787.95
26	STINGER	-16.48	-3.79	0.00	191.91	-4.87	1.23	0.00	839.92	-1128.52	-10.08	1128.53
29	STINGER	-26.11	-6.47	0.00	88.92	-4.49	1.18	0.00	838.35	-628.45	-7.85	628.48
32	STINGER	-34.87	-9.04	0.00	232.72	-4.67	0.58	0.00	835.98	-754.12	-7.54	754.12
35	STINGER	-44.37	-11.93	0.01	230.19	4.22	0.56	0.00	832.60	-1141.59	11.37	1141.59
38	STINGER	-53.04	-14.85	0.01	164.34	-15.23	0.14	0.00	827.30	-1132.08	-24.37	1132.20
41	STINGER	-62.24	-18.40	0.02	156.34	48.03	0.00	0.00	823.79	-1149.70	89.36	1150.74
43	STINGER	-72.16	-22.71	0.02	132.93	-67.21	0.00	0.00	819.07	-1014.58	-319.68	1044.37
45	STINGER	-75.00	-24.04	0.03	0.00	0.00	0.54	0.03	818.51	-782.76	-251.84	800.64
47	SAGBEND	-85.88	-29.43	0.14	0.00	0.00	0.00	0.00	813.54	-216.15	-113.62	218.95
48	SAGBEND	-96.78	-34.92	0.28	0.00	0.00	0.00	0.00	807.19	214.03	-66.13	214.03
49	SAGBEND	-107.71	-40.35	0.44	0.00	0.00	0.00	0.00	800.72	305.85	70.32	306.13
50	SAGBEND	-118.71	-45.64	0.57	0.00	0.00	0.00	0.00	794.41	348.98	78.66	349.99
51	SAGBEND	-129.79	-50.70	0.69	0.00	0.00	0.00	0.00	788.33	376.55	73.19	377.91
52	SAGBEND	-140.97	-55.56	0.81	0.00	0.00	0.00	0.00	782.55	375.72	80.74	376.87
53	SAGBEND	-152.25	-60.22	0.90	0.00	0.00	0.00	0.00	777.10	373.16	79.77	373.42
54	SAGBEND	-163.61	-64.64	0.95	0.00	0.00	0.00	0.00	772.40	368.00	75.54	369.03
55	SAGBEND	-175.06	-68.84	0.99	0.00	0.00	0.00	0.00	767.95	376.92	65.93	377.24
56	SAGBEND	-186.60	-72.81	1.01	0.00	0.00	0.00	0.00	763.67	374.36	61.53	374.63
57	SAGBEND	-198.23	-76.53	1.02	0.00	0.00	0.00	0.00	759.65	387.76	56.51	387.76
58	SAGBEND	-209.92	-80.00	1.02	0.00	0.00	0.00	0.00	756.12	397.31	53.83	397.34
59	SAGBEND	-221.69	-83.22	1.00	0.00	0.00	0.00	0.00	753.15	398.94	51.55	398.95
60	SAGBEND	-233.52	-86.15	0.98	0.00	0.00	0.00	0.00	750.46	391.94	62.63	392.60
61	SAGBEND	-245.43	-88.84	0.95	0.00	0.00	0.00	0.00	748.08	383.60	72.17	383.61
62	SAGBEND	-257.39	-91.27	0.90	0.00	0.00	0.00	0.00	746.30	380.01	71.54	380.03
63	SAGBEND	-269.39	-93.38	0.83	0.00	0.00	0.00	0.00	744.74	379.84	62.72	382.24
64	SAGBEND	-281.44	-95.27	0.74	0.00	0.00	0.00	0.00	743.38	388.59	49.50	389.75
65	SAGBEND	-293.54	-96.92	0.66	0.00	0.00	0.00	0.00	742.25	382.90	42.62	383.24
66	SAGBEND	-305.66	-98.32	0.57	0.00	0.00	0.00	0.00	741.40	397.05	44.44	397.19
67	SAGBEND	-317.81	-99.42	0.48	0.00	0.00	0.00	0.00	741.02	406.01	-47.28	406.62
68	SAGBEND	-329.98	-100.23	0.38	0.00	0.00	0.00	0.00	741.08	388.39	-55.98	388.40
69	SAGBEND	-342.17	-100.77	0.27	0.00	0.00	0.00	0.00	741.52	342.27	-56.47	342.76
70	SAGBEND	-354.36	-101.09	0.18	7.09	-4.18	0.00	0.00	742.34	284.14	-72.85	284.22
71	SAGBEND	-366.56	-101.23	0.09	20.79	-12.04	0.00	0.00	743.44	189.11	-99.40	193.00
72	SEABED	-378.76	-101.27	0.03	22.52	-12.60	0.00	0.00	744.52	90.92	-88.43	110.29
73	SEABED	-390.96	-101.27	0.00	19.28	-6.07	0.00	0.00	745.54	16.45	-54.60	55.03
74	SEABED	-403.16	-101.27	0.00	17.06	2.06	0.00	0.00	746.53	-6.71	-16.31	16.80
75	SEABED	-415.36	-101.27	0.00	15.56	1.14	0.00	0.00	747.48	-3.45	3.13	3.83
76	SEABED	-427.56	-101.27	0.00	15.18	0.34	0.00	0.00	748.38	-1.06	1.89	1.97
77	SEABED	-439.76	-101.27	0.00	15.21	-0.15	0.00	0.00	749.23	0.27	0.75	0.75
78	SEABED	-451.96	-101.27	0.00	0.00	-0.03	0.00	0.00	750.04	0.00	0.00	0.00

Water Depth 101 m (90°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.745	22.869	-.11	.00	-22.95	.00	19.61	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	16.39	.00	-7.61	-.02	22.85	5.10
9	LAYBARGE	57.08	5.14	.00	.000	1.809	39.248	16.37	.00	-6.60	.00	21.99	4.91
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	16.34	.00	-21.09	.00	34.27	7.65
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	16.31	.00	-64.64	.00	71.26	15.91
13	LAYBARGE	44.91	4.73	.00	.000	2.150	51.425	16.30	.00	-71.62	.00	77.17	17.23
14	TENSIONR	35.35	4.30	.00	.000	3.174	60.993	32.76	.00	-160.02	-.04	168.78	37.67
16	LAYBARGE	23.34	3.42	.00	.000	5.427	73.039	32.57	.00	-260.00	.00	253.57	56.60
18	LAYBARGE	8.89	1.61	.00	.000	8.961	87.606	32.24	.00	-329.11	.01	311.98	69.64
20	LAYBARGE	3.11	.61	.00	-.001	10.698	93.474	32.08	.00	-308.13	-.26	294.00	65.62
24	STINGER	-7.60	-1.67	.00	-.004	13.082	104.417	31.82	-.27	-182.91	-1.59	187.44	41.84
26	STINGER	-16.47	-3.85	.00	-.011	14.541	113.562	31.53	-.62	-168.58	-1.25	175.14	39.09
29	STINGER	-26.15	-6.48	.00	-.016	15.840	123.587	31.20	-1.04	-120.59	-1.04	134.23	29.96
32	STINGER	-34.92	-9.06	.01	-.022	17.007	132.732	30.84	-1.46	-161.74	-1.46	169.05	37.74
35	STINGER	-44.36	-12.08	.01	-.019	18.473	142.646	30.44	-1.94	-166.78	.82	173.18	38.66
38	STINGER	-52.99	-15.11	.01	-.044	20.304	151.790	29.99	-2.43	-272.22	-7.60	262.69	58.64
41	STINGER	-62.14	-18.71	.02	.046	22.644	161.620	29.52	-3.00	-251.74	24.65	246.04	54.92
43	STINGER	-72.03	-23.07	.02	-.329	24.947	172.428	28.94	-3.70	-221.92	-95.84	236.28	52.74
45	STINGER	-74.86	-24.41	.05	-.610	25.520	175.564	28.79	-3.92	-164.17	-75.73	184.46	41.17
47	SAGBEND	-85.75	-29.76	.23	-1.212	26.508	187.696	28.10	-4.78	-25.18	-25.05	60.82	13.58
48	SAGBEND	-96.66	-35.20	.48	-1.367	26.383	199.896	27.38	-5.65	38.44	-1.99	63.11	14.09
49	SAGBEND	-107.62	-40.57	.74	-1.318	25.744	212.096	26.66	-6.51	67.96	8.24	88.28	19.71
50	SAGBEND	-118.64	-45.79	.98	-1.179	24.864	224.296	25.96	-7.35	82.19	12.61	100.52	22.44
51	SAGBEND	-129.75	-50.82	1.19	-1.006	23.863	236.496	25.29	-8.16	89.53	14.18	106.65	23.81
52	SAGBEND	-140.96	-55.65	1.37	-.824	22.798	248.696	24.64	-8.93	93.73	14.33	109.98	24.55
53	SAGBEND	-152.25	-60.27	1.52	-.647	21.694	260.896	24.02	-9.68	96.48	13.81	112.02	25.00
54	SAGBEND	-163.62	-64.67	1.63	-.479	20.562	273.096	23.44	-10.38	98.55	13.03	113.48	25.33
55	SAGBEND	-175.09	-68.84	1.71	-.323	19.408	285.296	22.88	-11.05	100.27	12.18	114.66	25.59
56	SAGBEND	-186.64	-72.77	1.76	-.178	18.236	297.496	22.35	-11.68	101.80	11.34	115.71	25.83
57	SAGBEND	-198.26	-76.47	1.78	-.044	17.047	309.696	21.86	-12.28	103.21	10.55	116.67	26.04
58	SAGBEND	-209.96	-79.93	1.78	.079	15.841	321.896	21.40	-12.83	104.52	9.82	117.57	26.24
59	SAGBEND	-221.73	-83.13	1.75	.193	14.622	334.096	20.97	-13.35	105.74	9.15	118.43	26.43
60	SAGBEND	-233.57	-86.08	1.70	.300	13.388	346.296	20.58	-13.82	106.88	8.55	119.22	26.61
61	SAGBEND	-245.47	-88.78	1.62	.398	12.142	358.496	20.22	-14.25	107.91	8.01	119.96	26.78
62	SAGBEND	-257.42	-91.22	1.53	.490	10.884	370.696	19.89	-14.64	108.83	7.52	120.61	26.92
63	SAGBEND	-269.43	-93.39	1.42	.576	9.617	382.896	19.60	-14.99	109.62	7.06	121.16	27.04
64	SAGBEND	-281.48	-95.29	1.29	.657	8.341	395.097	19.35	-15.30	110.20	6.61	121.56	27.13
65	SAGBEND	-293.57	-96.93	1.14	.731	7.061	407.297	19.13	-15.56	110.47	6.09	121.70	27.16
66	SAGBEND	-305.69	-98.29	.98	.799	5.780	419.497	18.95	-15.78	110.19	5.39	121.38	27.09
67	SAGBEND	-317.84	-99.38	.81	.855	4.508	431.697	18.80	-15.96	108.88	4.23	120.19	26.83
68	SAGBEND	-330.01	-100.21	.62	.893	3.261	443.898	18.69	-16.09	105.50	2.03	117.25	26.17
69	SAGBEND	-342.20	-100.78	.43	.894	2.076	456.098	18.62	-16.18	97.87	-2.42	110.81	24.73
70	SAGBEND	-354.39	-101.10	.24	.819	1.024	468.298	18.58	-16.23	81.42	-11.70	97.62	21.79
71	SEABED	-366.59	-101.23	.09	.590	.256	480.499	18.56	-16.25	46.46	-29.53	74.81	16.70
72	SEABED	-378.79	-101.25	.01	.180	-.016	492.699	18.56	-16.26	5.96	-31.02	55.36	12.36
73	SEABED	-390.99	-101.24	.00	-.008	-.017	504.899	18.56	-16.25	-2.01	-4.35	33.83	7.55
74	SEABED	-403.19	-101.24	.00	-.011	-.001	517.099	18.56	-16.25	-.62	1.28	31.25	6.98
75	SEABED	-415.39	-101.24	.00	-.001	.001	529.299	18.56	-16.25	.04	.41	30.48	6.80
76	SEABED	-427.59	-101.24	.00	.001	.000	541.499	18.56	-16.25	.04	-.03	30.21	6.74
77	SEABED	-439.79	-101.24	.00	.000	.000	553.699	18.56	-16.25	.00	-.03	30.19	6.74
78	SEABED	-451.99	-101.24	.00	.000	.000	565.899	18.56	-16.25	.00	.00	30.18	6.74
79	SEABED	-464.19	-101.24	.00	.000	.000	578.099	18.56	-16.25	.00	.00	30.18	6.74
80	SEABED	-476.39	-101.24	.00	.000	.000	590.299	18.56	-16.25	.00	.00	30.17	6.74
81	SEABED	-488.59	-101.24	.00	.000	.000	602.499	18.56	-16.25	.00	.00	30.17	6.74
82	SEABED	-500.79	-101.24	.00	.000	.000	614.699	18.56	-16.25	.00	.00	30.17	6.74

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.47	.00	.00	.00	-1.36	-77.24	.00	77.24
5	LAYBARGE	73.45	5.65	.00	50.05	.00	.00	.00	-2.64	-67.29	.00	67.29
7	TENSIONR	60.11	5.23	.00	43.35	.09	.00	.00	402.80	-22.31	-.07	22.31
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	402.42	-19.37	.00	19.37
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	401.63	-61.86	.00	61.86
11	LAYBARGE	46.45	4.79	.00	36.75	.00	.00	.00	400.88	-189.57	.00	189.57
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	400.64	-210.01	.00	210.01
14	TENSIONR	35.35	4.30	.00	73.57	.15	.00	.00	805.33	-469.27	-.11	469.27
16	LAYBARGE	23.34	3.42	.00	105.05	.00	.00	.00	800.71	-762.44	-.01	762.44
18	LAYBARGE	8.89	1.61	.00	101.78	.14	.00	.00	792.42	-965.11	.04	965.11
20	LAYBARGE	3.11	.61	.00	75.45	-.77	.00	.00	788.64	-903.59	-.75	903.59
24	STINGER	-7.60	-1.67	.00	12.12	-2.65	.00	.00	785.58	-536.39	-4.66	536.41

26	STINGER	-16.47	-3.85	.00	40.29	-2.35	.00	.00	782.98	-494.36	-3.67	494.37
29	STINGER	-26.15	-6.48	.00	.00	-2.16	.02	.00	780.05	-353.63	-3.04	353.64
32	STINGER	-34.92	-9.06	.01	41.34	-3.12	.00	.00	776.55	-474.29	-4.28	474.31
35	STINGER	-44.36	-12.08	.01	.00	1.13	.02	.00	772.76	-489.07	2.40	489.08
38	STINGER	-52.99	-15.11	.01	80.32	-14.65	.00	.00	767.86	-798.29	-22.30	798.60
41	STINGER	-62.14	-18.71	.02	44.70	39.95	.00	.00	763.64	-738.24	72.29	741.77
43	STINGER	-72.03	-23.07	.02	72.84	-59.12	.00	.00	758.34	-650.77	-281.04	708.86
45	STINGER	-74.86	-24.41	.05	.00	.00	.53	.02	757.31	-481.44	-222.08	530.19
47	SAGBEND	-85.75	-29.76	.23	.00	.00	.00	.00	751.42	-73.84	-73.47	104.16
48	SAGBEND	-96.66	-35.20	.48	.00	.00	.00	.00	744.64	112.72	-5.85	112.87
49	SAGBEND	-107.62	-40.57	.74	.00	.00	.00	.00	737.89	199.29	24.16	200.75
50	SAGBEND	-118.64	-45.79	.98	.00	.00	.00	.00	731.35	241.03	36.98	243.85
51	SAGBEND	-129.75	-50.82	1.19	.00	.00	.00	.00	725.06	262.55	41.59	265.82
52	SAGBEND	-140.96	-55.65	1.37	.00	.00	.00	.00	719.03	274.87	42.03	278.06
53	SAGBEND	-152.25	-60.27	1.52	.00	.00	.00	.00	713.27	282.94	40.50	285.82
54	SAGBEND	-163.62	-64.67	1.63	.00	.00	.00	.00	707.79	289.00	38.22	291.51
55	SAGBEND	-175.09	-68.84	1.71	.00	.00	.00	.00	702.59	294.05	35.72	296.21
56	SAGBEND	-186.64	-72.77	1.76	.00	.00	.00	.00	697.69	298.54	33.26	300.39
57	SAGBEND	-198.26	-76.47	1.78	.00	.00	.00	.00	693.09	302.67	30.94	304.24
58	SAGBEND	-209.96	-79.93	1.78	.00	.00	.00	.00	688.78	306.51	28.79	307.86
59	SAGBEND	-221.73	-83.13	1.75	.00	.00	.00	.00	684.79	310.09	26.84	311.25
60	SAGBEND	-233.57	-86.08	1.70	.00	.00	.00	.00	681.11	313.41	25.07	314.42
61	SAGBEND	-245.47	-88.78	1.62	.00	.00	.00	.00	677.75	316.45	23.48	317.32
62	SAGBEND	-257.42	-91.22	1.53	.00	.00	.00	.00	674.72	319.16	22.04	319.92
63	SAGBEND	-269.43	-93.39	1.42	.00	.00	.00	.00	672.02	321.45	20.70	322.11
64	SAGBEND	-281.48	-95.29	1.29	.00	.00	.00	.00	669.64	323.15	19.37	323.73
65	SAGBEND	-293.57	-96.93	1.14	.00	.00	.00	.00	667.61	323.95	17.87	324.44
66	SAGBEND	-305.69	-98.29	.98	.00	.00	.00	.00	665.91	323.14	15.81	323.53
67	SAGBEND	-317.84	-99.38	.81	.00	.00	.00	.00	664.56	319.29	12.39	319.53
68	SAGBEND	-330.01	-100.21	.62	.00	.00	.00	.00	663.55	309.37	5.95	309.42
69	SAGBEND	-342.20	-100.78	.43	.00	.00	.00	.00	662.89	287.00	-7.09	287.09
70	SAGBEND	-354.39	-101.10	.24	.00	.00	.00	.00	662.55	238.75	-34.31	241.20
71	SEABED	-366.59	-101.23	.09	7.45	-7.55	.00	.00	662.48	136.24	-86.59	161.43
72	SEABED	-378.79	-101.25	.01	22.22	-11.08	.00	.00	662.50	17.47	-90.98	92.64
73	SEABED	-390.99	-101.24	.00	17.52	4.56	.00	.00	662.52	-5.90	-12.75	14.05
74	SEABED	-403.19	-101.24	.00	15.06	1.61	.00	.00	662.52	-1.82	3.75	4.17
75	SEABED	-415.39	-101.24	.00	15.02	-.07	.00	.00	662.52	.12	1.20	1.20
76	SEABED	-427.59	-101.24	.00	15.16	-.10	.00	.00	662.52	.12	-.07	.14
77	SEABED	-439.79	-101.24	.00	15.18	-.01	.00	.00	662.52	.01	-.08	.08
78	SEABED	-451.99	-101.24	.00	15.18	.00	.00	.00	662.52	-.01	-.01	.01
79	SEABED	-464.19	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
80	SEABED	-476.39	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
81	SEABED	-488.59	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
82	SEABED	-500.79	-101.24	.00	.00	.00	.00	.00	662.52	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.31	6.29	0.00	0.000	1.574	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.28	5.96	0.00	0.000	1.571	12.04	-0.0001	0.0000	-0.0137	-0.0002	0.0137	0.00
5	LAYBARGE	73.45	5.65	0.00	0.000	1.744	22.87	-0.0002	0.0000	-0.0113	-0.0002	0.0114	0.00
7	TENSIONR	60.10	5.23	0.00	0.000	1.773	36.22	0.0087	0.0000	-0.0038	-0.0002	0.0125	0.00
9	LAYBARGE	57.08	5.14	0.00	0.000	1.806	39.25	0.0087	0.0000	-0.0033	0.0000	0.0119	0.00
10	LAYBARGE	51.09	4.94	0.00	0.000	1.862	45.24	0.0087	0.0000	-0.0106	-0.0003	0.0192	0.00
11	LAYBARGE	46.44	4.79	0.00	0.000	2.050	49.89	0.0087	0.0000	-0.0321	0.0003	0.0406	0.00
13	LAYBARGE	44.91	4.73	0.00	0.001	2.152	51.42	0.0087	0.0000	-0.0350	-0.0004	0.0435	0.00
14	TENSIONR	35.35	4.30	0.00	0.001	3.165	60.99	0.0168	0.0000	-0.0779	-0.0012	0.0944	0.00
16	LAYBARGE	23.34	3.42	0.00	0.001	5.428	73.04	0.0167	0.0000	-0.1386	0.0018	0.1549	0.00
18	LAYBARGE	8.89	1.61	0.00	0.001	8.781	87.61	0.0166	0.0000	-0.1662	-0.0029	0.1825	0.00
20	LAYBARGE	3.11	0.61	0.00	-0.002	10.329	93.47	0.0165	0.0000	-0.2505	0.0041	0.2656	0.00
24	STINGER	-7.62	-1.62	0.01	-0.006	12.932	104.43	0.0164	-0.0001	-0.1286	-0.0047	0.1441	0.00
26	STINGER	-16.50	-3.80	0.01	-0.008	14.554	113.57	0.0163	-0.0003	-0.1847	-0.0026	0.1995	0.00
29	STINGER	-26.15	-6.47	0.01	-0.001	15.858	123.59	0.0162	-0.0005	-0.1409	-0.0023	0.1555	0.00
32	STINGER	-34.92	-9.05	0.01	-0.005	17.137	132.74	0.0160	-0.0007	-0.1594	-0.0029	0.1738	0.00
35	STINGER	-44.37	-12.06	0.01	-0.003	18.621	142.65	0.0158	-0.0010	-0.1867	0.0026	0.2011	0.00
38	STINGER	-53.00	-15.09	0.01	-0.039	20.526	151.80	0.0156	-0.0012	-0.1836	-0.0064	0.1990	0.00
41	STINGER	-62.14	-18.71	0.01	0.053	22.787	161.63	0.0154	-0.0015	-0.1736	0.0233	0.1877	0.00
43	STINGER	-72.03	-23.10	0.02	-0.360	25.255	172.44	0.0151	-0.0018	-0.1594	-0.0829	0.1876	0.00
45	STINGER	-74.86	-24.45	0.05	-0.669	25.792	175.56	0.0151	-0.0019	-0.1238	-0.0655	0.1488	0.00
47	SAGBEND	-85.75	-29.84	0.25	-1.321	26.718	187.70	0.0148	-0.0023	-0.0371	-0.0261	0.0539	0.00
48	SAGBEND	-96.66	-35.30	0.53	-1.493	26.554	199.90	0.0144	-0.0028	0.0424	-0.0124	0.0571	0.00
49	SAGBEND	-107.61	-40.67	0.82	-1.415	25.899	212.10	0.0141	-0.0032	0.0544	0.0153	0.0695	0.00
50	SAGBEND	-118.63	-45.88	1.08	-1.279	24.977	224.30	0.0138	-0.0036	0.0595	0.0175	0.0750	0.00
51	SAGBEND	-129.74	-50.92	1.30	-1.090	23.934	236.50	0.0135	-0.0040	0.0635	0.0169	0.0788	0.00
52	SAGBEND	-140.94	-55.74	1.48	-0.866	22.829	248.70	0.0132	-0.0044	0.0650	0.0166	0.0801	0.00
53	SAGBEND	-152.23	-60.34	1.65	-0.710	21.707	260.90	0.0129	-0.0047	0.0646	0.0161	0.0796	0.00
54	SAGBEND	-163.62	-64.76	1.77	-0.564	20.576	273.10	0.0126	-0.0051	0.0637	0.0144	0.0785	0.00
55	SAGBEND	-175.07	-68.94	1.85	-0.369	19.408	285.30	0.0124	-0.0054	0.0649	0.0145	0.0790	0.00
56	SAGBEND	-186.61	-72.91	1.92	-0.159	18.271	297.50	0.0121	-0.0057	0.0647	0.0149	0.0792	0.00
57	SAGBEND	-198.24	-76.62	1.95	-0.052	17.087	309.70	0.0119	-0.0060	0.0659	0.0141	0.0791	0.00
58	SAGBEND	-209.94	-80.08	1.93	0.062	15.829	321.90	0.0117	-0.0062	0.0667	0.0116	0.0800	0.00
59	SAGBEND	-221.72	-83.28	1.89	0.208	14.555	334.10	0.0115	-0.0065	0.0676	0.0098	0.0806	0.00
60	SAGBEND	-233.56	-86.22	1.83	0.333	13.285	346.30	0.0113	-0.0067	0.0676	0.0096	0.0802	0.00
61	SAGBEND	-245.46	-88.90	1.78	0.396	11.996	358.50	0.0112	-0.0069	0.0658	0.0102	0.0783	0.00
62	SAGBEND	-257.42	-91.33	1.69	0.449	10.723	370.70	0.0110	-0.0071	0.0628	0.0110	0.0762	0.00
63	SAGBEND	-269.42	-93.47	1.58	0.548	9.464	382.90	0.0109	-0.0073	0.0629	0.0128	0.0771	0.00
64	SAGBEND	-281.47	-95.32	1.44	0.685	8.305	395.10	0.0108	-0.0074	0.0634	0.0133	0.0777	0.00
65	SAGBEND	-293.56	-96.91	1.29	0.778	7.085	407.30	0.0107	-0.0076	0.0629	0.0125	0.0772	0.00

66	SAGBEND	-305.68	-98.28	1.11	0.894	5.718	419.50	0.0106	-0.0077	0.0666	0.0106	0.0809	0.00
67	SAGBEND	-317.84	-99.41	0.90	0.949	4.436	431.70	0.0106	-0.0077	0.0688	0.0096	0.0828	0.00
68	SAGBEND	-330.01	-100.25	0.71	1.006	3.299	443.89	0.0105	-0.0078	0.0662	0.0082	0.0803	0.00
69	SAGBEND	-342.19	-100.82	0.52	1.007	2.014	456.10	0.0105	-0.0078	0.0577	-0.0108	0.0711	0.00
70	SAGBEND	-354.38	-101.11	0.33	0.912	0.943	468.30	0.0105	-0.0079	0.0450	-0.0175	0.0576	0.00
71	SEABED	-366.58	-101.24	0.16	0.646	0.311	480.49	0.0105	-0.0079	0.0312	-0.0230	0.0448	0.00
72	SEABED	-378.78	-101.27	0.05	0.352	0.032	492.69	0.0105	-0.0079	0.0123	-0.0189	0.0333	0.00
73	SEABED	-390.98	-101.27	0.01	0.110	-0.029	504.90	0.0106	-0.0079	0.0016	-0.0143	0.0281	0.00
74	SEABED	-403.18	-101.27	0.00	0.001	-0.011	517.10	0.0106	-0.0079	-0.0011	-0.0045	0.0194	0.00
75	SEABED	-415.38	-101.27	0.00	-0.010	-0.002	529.30	0.0106	-0.0079	-0.0005	0.0007	0.0163	0.00
76	SEABED	-427.58	-101.27	0.00	-0.004	0.001	541.50	0.0106	-0.0079	-0.0001	0.0005	0.0163	0.00
77	SEABED	-439.78	-101.27	0.00	0.000	0.001	553.70	0.0106	-0.0079	0.0001	0.0002	0.0162	0.00
78	SEABED	-451.98	-101.27	0.00	0.001	0.000	565.90	0.0106	-0.0079	0.0000	0.0000	0.0161	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT VERT (KN)	REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.29	0.00	17.04	0.80	0.00	0.00	0.00	4.71	-0.22	4.71
3	LAYBARGE	84.28	5.96	0.00	57.64	1.98	0.00	0.00	-4.09	-82.98	-1.51	82.98
5	LAYBARGE	73.45	5.65	0.00	51.19	1.73	0.00	0.00	-7.85	-68.40	-1.14	68.40
7	TENSIONR	60.10	5.23	0.00	44.75	2.37	0.00	0.00	444.49	-22.98	-1.03	22.98
9	LAYBARGE	57.08	5.14	0.00	0.00	0.00	0.00	0.00	444.30	-19.92	0.30	19.92
10	LAYBARGE	51.09	4.94	0.00	0.00	0.00	0.00	0.00	443.85	-64.51	-2.01	64.51
11	LAYBARGE	46.44	4.79	0.00	40.81	1.94	0.00	0.00	443.35	-194.71	2.06	194.71
13	LAYBARGE	44.91	4.73	0.00	0.00	0.00	0.00	0.00	443.18	-212.65	-2.64	212.65
14	TENSIONR	35.35	4.30	0.00	76.81	-1.52	0.00	0.00	854.39	-472.61	-7.03	472.62
16	LAYBARGE	23.34	3.42	0.00	144.28	2.20	0.00	0.00	851.11	-841.03	11.09	841.04
18	LAYBARGE	8.89	1.61	0.00	161.44	-8.90	0.01	0.00	844.78	-1008.81	-17.65	1008.88
20	LAYBARGE	3.11	0.61	0.00	238.85	-8.13	0.07	0.00	842.01	-1426.56	24.99	1426.57
24	STINGER	-7.62	-1.62	0.01	88.31	-22.19	0.18	0.00	840.04	-780.51	-28.68	780.51
26	STINGER	-16.50	-3.80	0.01	152.98	-7.88	0.55	0.00	837.75	-1120.40	-15.56	1120.51
29	STINGER	-26.15	-6.47	0.01	72.65	-7.67	0.52	0.00	836.23	-855.02	-13.88	855.08
32	STINGER	-34.92	-9.05	0.01	139.86	-6.48	0.24	0.00	833.59	-967.47	-17.34	967.47
35	STINGER	-44.37	-12.06	0.01	143.47	6.08	0.23	0.00	830.24	-1132.33	16.00	1132.35
38	STINGER	-53.00	-15.09	0.01	132.94	-23.59	0.02	0.00	826.30	-1113.83	-38.81	1114.29
41	STINGER	-62.14	-18.71	0.01	123.72	75.34	0.01	0.00	822.22	-1053.27	141.63	1053.52
43	STINGER	-72.03	-23.10	0.02	130.20	-105.96	0.01	0.00	817.78	-967.31	-503.04	1043.78
45	STINGER	-74.86	-24.45	0.05	0.00	0.00	0.57	0.04	817.06	-751.45	-397.80	808.67
47	SAGBEND	-85.75	-29.84	0.25	0.00	0.00	0.00	0.00	812.15	-224.94	-158.28	234.16
48	SAGBEND	-96.66	-35.30	0.53	0.00	0.00	0.00	0.00	806.19	257.39	-75.37	257.42
49	SAGBEND	-107.61	-40.67	0.82	0.00	0.00	0.00	0.00	800.17	330.42	92.65	331.51
50	SAGBEND	-118.63	-45.88	1.08	0.00	0.00	0.00	0.00	794.28	361.29	106.17	364.53
51	SAGBEND	-129.74	-50.92	1.30	0.00	0.00	0.00	0.00	788.60	385.65	102.86	388.61
52	SAGBEND	-140.94	-55.74	1.48	0.00	0.00	0.00	0.00	783.24	394.83	100.50	397.70
53	SAGBEND	-152.23	-60.34	1.65	0.00	0.00	0.00	0.00	778.25	391.88	97.84	393.82
54	SAGBEND	-163.62	-64.76	1.77	0.00	0.00	0.00	0.00	773.65	386.59	87.21	387.87
55	SAGBEND	-175.07	-68.94	1.85	0.00	0.00	0.00	0.00	769.36	393.74	88.27	395.15
56	SAGBEND	-186.61	-72.91	1.92	0.00	0.00	0.00	0.00	765.33	392.47	90.33	393.95
57	SAGBEND	-198.24	-76.62	1.95	0.00	0.00	0.00	0.00	761.52	399.85	85.61	400.77
58	SAGBEND	-209.94	-80.08	1.93	0.00	0.00	0.00	0.00	757.93	404.97	70.11	406.47
59	SAGBEND	-221.72	-83.28	1.89	0.00	0.00	0.00	0.00	754.61	410.65	59.51	412.00
60	SAGBEND	-233.56	-86.22	1.83	0.00	0.00	0.00	0.00	751.58	410.48	58.27	411.10
61	SAGBEND	-245.46	-88.90	1.78	0.00	0.00	0.00	0.00	748.98	399.68	62.08	399.75
62	SAGBEND	-257.42	-91.33	1.69	0.00	0.00	0.00	0.00	746.68	381.48	66.60	381.84
63	SAGBEND	-269.42	-93.47	1.58	0.00	0.00	0.00	0.00	744.69	381.71	77.74	383.42
64	SAGBEND	-281.47	-95.32	1.44	0.00	0.00	0.00	0.00	743.04	385.05	80.85	385.55
65	SAGBEND	-293.56	-96.91	1.29	0.00	0.00	0.00	0.00	741.76	381.59	75.86	383.02
66	SAGBEND	-305.68	-98.28	1.11	0.00	0.00	0.00	0.00	740.88	404.05	64.07	407.17
67	SAGBEND	-317.84	-99.41	0.90	0.00	0.00	0.00	0.00	740.53	417.47	58.27	419.01
68	SAGBEND	-330.01	-100.25	0.71	0.00	0.00	0.00	0.00	740.51	401.69	49.47	402.97
69	SAGBEND	-342.19	-100.82	0.52	0.01	-0.02	0.00	0.00	740.74	350.31	-65.66	350.31
70	SAGBEND	-354.38	-101.11	0.33	8.52	-5.67	0.00	0.00	741.17	273.42	-106.11	273.98
71	SEABED	-366.58	-101.24	0.16	22.37	-14.70	0.00	0.00	741.78	189.19	-139.84	194.50
72	SEABED	-378.78	-101.27	0.05	21.36	-13.55	0.00	0.00	742.54	74.54	-114.86	123.22
73	SEABED	-390.98	-101.27	0.01	19.27	-8.82	0.00	0.00	743.24	9.77	-87.05	87.05
74	SEABED	-403.18	-101.27	0.00	16.68	2.83	0.00	0.00	743.94	-6.48	-27.41	28.05
75	SEABED	-415.38	-101.27	0.00	15.38	1.78	0.00	0.00	744.60	-2.93	4.12	4.15
76	SEABED	-427.58	-101.27	0.00	15.20	0.59	0.00	0.00	745.23	-0.66	2.94	2.95
77	SEABED	-439.78	-101.27	0.00	15.21	-0.14	0.00	0.00	745.83	0.38	1.25	1.26
78	SEABED	-451.98	-101.27	0.00	0.00	-0.03	0.00	0.00	746.40	0.00	0.00	0.00

Water Depth 101 m (135°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.95	.00	19.62	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	16.39	.00	-7.59	-.01	22.84	5.10
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	16.37	.00	-6.61	.00	21.99	4.91
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	16.34	.00	-21.16	.00	34.32	7.66
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	16.31	.00	-64.74	.00	71.34	15.92
13	LAYBARGE	44.91	4.73	.00	.000	2.151	51.425	16.30	.00	-71.65	.00	77.20	17.23
14	TENSIONR	35.35	4.30	.00	.000	3.173	60.993	32.76	.00	-159.72	-.02	168.53	37.62
16	LAYBARGE	23.34	3.42	.00	.000	5.433	73.039	32.57	.00	-261.62	.00	254.95	56.91
18	LAYBARGE	8.89	1.61	.00	.000	8.935	87.606	32.24	.00	-322.59	.01	306.45	68.40
20	LAYBARGE	3.11	.61	.00	.000	10.770	93.474	32.06	.00	-349.85	-.13	329.42	73.53
24	STINGER	-7.61	-1.72	.00	-.002	13.481	104.442	31.80	-.28	-205.32	-.84	206.46	46.09
26	STINGER	-16.47	-3.98	.00	-.006	15.121	113.586	31.51	-.64	-188.78	-.66	192.29	42.92
29	STINGER	-26.11	-6.71	.00	-.008	16.419	123.606	31.17	-1.08	-100.31	-.55	116.98	26.11
32	STINGER	-34.86	-9.36	.00	-.012	17.224	132.750	30.82	-1.50	-95.75	-.76	112.97	25.22
35	STINGER	-44.29	-12.37	.01	-.010	18.226	142.644	30.41	-1.99	-131.24	.44	142.97	31.91
38	STINGER	-52.94	-15.33	.01	-.024	19.811	151.788	29.97	-2.46	-249.52	-4.03	243.33	54.31
41	STINGER	-62.11	-18.83	.01	.024	21.940	161.603	29.51	-3.02	-228.14	13.08	225.28	50.29
43	STINGER	-72.05	-23.07	.01	-.173	24.259	172.412	28.93	-3.70	-248.58	-50.85	246.48	55.02
45	STINGER	-74.90	-24.38	.02	-.322	24.906	175.551	28.79	-3.91	-186.80	-40.18	193.19	43.12
47	SAGBEND	-85.85	-29.63	.12	-.640	26.087	187.696	28.12	-4.76	-37.42	-13.24	64.37	14.37
48	SAGBEND	-96.80	-35.01	.25	-.721	26.074	199.896	27.40	-5.62	30.89	-1.00	56.69	12.65
49	SAGBEND	-107.78	-40.32	.39	-.694	25.508	212.096	26.69	-6.47	62.58	4.42	83.44	18.63
50	SAGBEND	-118.83	-45.50	.52	-.620	24.683	224.296	26.00	-7.30	77.89	6.73	96.31	21.50
51	SAGBEND	-129.95	-50.50	.63	-.528	23.729	236.496	25.33	-8.11	85.84	7.55	102.87	22.96
52	SAGBEND	-141.17	-55.31	.72	-.431	22.704	248.696	24.69	-8.88	90.49	7.62	106.59	23.79
53	SAGBEND	-152.46	-59.92	.80	-.337	21.635	260.896	24.07	-9.62	93.61	7.33	109.01	24.33
54	SAGBEND	-163.85	-64.31	.86	-.248	20.534	273.096	23.48	-10.32	96.00	6.90	110.82	24.74
55	SAGBEND	-175.31	-68.47	.90	-.166	19.409	285.296	22.93	-10.99	98.02	6.43	112.32	25.07
56	SAGBEND	-186.86	-72.41	.92	-.089	18.261	297.496	22.40	-11.63	99.81	5.97	113.65	25.37
57	SAGBEND	-198.48	-76.12	.94	-.019	17.093	309.696	21.91	-12.22	101.46	5.54	114.87	25.64
58	SAGBEND	-210.18	-79.58	.93	.046	15.907	321.896	21.44	-12.78	102.98	5.14	116.01	25.89
59	SAGBEND	-221.95	-82.80	.92	.105	14.704	334.096	21.01	-13.29	104.40	4.78	117.06	26.13
60	SAGBEND	-233.78	-85.78	.89	.161	13.485	346.296	20.62	-13.77	105.71	4.45	118.04	26.35
61	SAGBEND	-245.67	-88.49	.85	.212	12.251	358.496	20.25	-14.21	106.91	4.15	118.93	26.55
62	SAGBEND	-257.62	-90.95	.80	.260	11.004	370.696	19.93	-14.60	107.98	3.89	119.74	26.73
63	SAGBEND	-269.62	-93.15	.74	.304	9.746	382.896	19.63	-14.95	108.90	3.64	120.42	26.88
64	SAGBEND	-281.67	-95.08	.67	.346	8.478	395.096	19.37	-15.27	109.61	3.40	120.95	27.00
65	SAGBEND	-293.75	-96.75	.60	.384	7.204	407.297	19.15	-15.53	110.03	3.13	121.23	27.06
66	SAGBEND	-305.87	-98.14	.51	.419	5.927	419.497	18.97	-15.76	109.93	2.77	121.08	27.03
67	SAGBEND	-318.02	-99.27	.42	.448	4.656	431.697	18.82	-15.94	108.86	2.17	120.13	26.81
68	SAGBEND	-330.19	-100.12	.32	.467	3.408	443.898	18.70	-16.07	105.89	1.05	117.57	26.24
69	SAGBEND	-342.38	-100.72	.22	.468	2.214	456.098	18.62	-16.17	99.02	-1.21	111.76	24.95
70	SAGBEND	-354.57	-101.07	.13	.430	1.141	468.298	18.58	-16.23	84.09	-5.91	99.34	22.17
71	SAGBEND	-366.77	-101.22	.05	.311	.327	480.499	18.56	-16.25	52.24	-15.81	74.43	16.61
72	SEABED	-378.97	-101.25	.00	.085	-.005	492.699	18.56	-16.26	8.90	-16.14	44.63	9.96
73	SEABED	-391.17	-101.24	.00	-.007	-.020	504.899	18.56	-16.25	-1.97	-1.76	32.18	7.18
74	SEABED	-403.37	-101.24	.00	-.006	-.002	517.099	18.56	-16.25	-.79	.73	30.99	6.92
75	SEABED	-415.57	-101.24	.00	.000	.001	529.299	18.56	-16.25	.01	.19	30.32	6.77
76	SEABED	-427.77	-101.24	.00	.000	.000	541.499	18.56	-16.25	.05	-.02	30.21	6.74
77	SEABED	-439.97	-101.24	.00	.000	.000	553.699	18.56	-16.25	.01	-.01	30.19	6.74
78	SEABED	-452.17	-101.24	.00	.000	.000	565.899	18.56	-16.25	.00	.00	30.18	6.74
79	SEABED	-464.37	-101.24	.00	.000	.000	578.099	18.56	-16.25	.00	.00	30.18	6.74
80	SEABED	-476.57	-101.24	.00	.000	.000	590.299	18.56	-16.25	.00	.00	30.17	6.74
81	SEABED	-488.77	-101.24	.00	.000	.000	602.499	18.56	-16.25	.00	.00	30.17	6.74
82	SEABED	-500.97	-101.24	.00	.000	.000	614.699	18.56	-16.25	.00	.00	30.17	6.74

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.47	.00	.00	.00	-1.36	-77.24	.00	77.24
5	LAYBARGE	73.45	5.65	.00	50.06	.00	.00	.00	-2.64	-67.31	.00	67.31
7	TENSIONR	60.11	5.23	.00	43.31	.05	.00	.00	402.79	-22.25	-.04	22.25
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	402.41	-19.37	.00	19.37
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	401.62	-62.05	.00	62.05
11	LAYBARGE	46.45	4.79	.00	36.94	.00	.00	.00	400.87	-189.85	.00	189.85
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	400.63	-210.11	.00	210.11
14	TENSIONR	35.35	4.30	.00	72.86	.09	.00	.00	805.33	-468.38	-.07	468.38
16	LAYBARGE	23.34	3.42	.00	107.35	.00	.00	.00	800.68	-767.20	.00	767.20
18	LAYBARGE	8.89	1.61	.00	75.70	.07	.00	.00	792.52	-946.01	.02	946.01
20	LAYBARGE	3.11	.61	.00	108.23	-.40	.00	.00	787.96	-1025.92	-.39	1025.92
24	STINGER	-7.61	-1.72	.00	10.56	-1.37	.00	.00	785.30	-602.09	-2.46	602.09

26	STINGER	-16.47	-3.98	.00	52.77	-1.21	.00	.00	782.64	-553.59	-1.93	553.59
29	STINGER	-26.11	-6.71	.00	.00	-1.12	.00	.00	779.86	-294.17	-1.60	294.17
32	STINGER	-34.86	-9.36	.00	10.82	-1.63	.00	.00	776.59	-280.79	-2.24	280.80
35	STINGER	-44.29	-12.37	.01	.00	.61	.03	.00	772.66	-384.87	1.28	384.87
38	STINGER	-52.94	-15.33	.01	81.45	-7.77	.00	.00	767.87	-731.71	-11.81	731.81
41	STINGER	-62.11	-18.83	.01	28.50	21.18	.00	.00	763.76	-669.03	38.35	670.13
43	STINGER	-72.05	-23.07	.01	91.35	-31.40	.00	.00	758.19	-728.97	-149.11	744.06
45	STINGER	-74.90	-24.38	.02	.00	.00	.53	.01	757.25	-547.79	-117.84	560.32
47	SAGBEND	-85.85	-29.63	.12	.00	.00	.00	.00	751.56	-109.73	-38.83	116.39
48	SAGBEND	-96.80	-35.01	.25	.00	.00	.00	.00	744.89	90.57	-2.93	90.62
49	SAGBEND	-107.78	-40.32	.39	.00	.00	.00	.00	738.21	183.52	12.97	183.98
50	SAGBEND	-118.83	-45.50	.52	.00	.00	.00	.00	731.72	228.41	19.73	229.26
51	SAGBEND	-129.95	-50.50	.63	.00	.00	.00	.00	725.46	251.73	22.15	252.70
52	SAGBEND	-141.17	-55.31	.72	.00	.00	.00	.00	719.46	265.35	22.35	266.29
53	SAGBEND	-152.46	-59.92	.80	.00	.00	.00	.00	713.72	274.52	21.49	275.36
54	SAGBEND	-163.85	-64.31	.86	.00	.00	.00	.00	708.25	281.53	20.23	282.26
55	SAGBEND	-175.31	-68.47	.90	.00	.00	.00	.00	703.05	287.44	18.86	288.06
56	SAGBEND	-186.86	-72.41	.92	.00	.00	.00	.00	698.15	292.70	17.52	293.23
57	SAGBEND	-198.48	-76.12	.94	.00	.00	.00	.00	693.53	297.53	16.24	297.97
58	SAGBEND	-210.18	-79.58	.93	.00	.00	.00	.00	689.21	302.00	15.07	302.38
59	SAGBEND	-221.95	-82.80	.92	.00	.00	.00	.00	685.20	306.16	14.01	306.48
60	SAGBEND	-233.78	-85.78	.89	.00	.00	.00	.00	681.50	310.00	13.05	310.27
61	SAGBEND	-245.67	-88.49	.85	.00	.00	.00	.00	678.11	313.50	12.18	313.74
62	SAGBEND	-257.62	-90.95	.80	.00	.00	.00	.00	675.05	316.64	11.40	316.84
63	SAGBEND	-269.62	-93.15	.74	.00	.00	.00	.00	672.31	319.34	10.68	319.51
64	SAGBEND	-281.67	-95.08	.67	.00	.00	.00	.00	669.90	321.44	9.98	321.60
65	SAGBEND	-293.75	-96.75	.60	.00	.00	.00	.00	667.83	322.66	9.18	322.79
66	SAGBEND	-305.87	-98.14	.51	.00	.00	.00	.00	666.09	322.36	8.12	322.46
67	SAGBEND	-318.02	-99.27	.42	.00	.00	.00	.00	664.70	319.23	6.36	319.29
68	SAGBEND	-330.19	-100.12	.32	.00	.00	.00	.00	663.65	310.51	3.08	310.52
69	SAGBEND	-342.38	-100.72	.22	.00	.00	.00	.00	662.94	290.38	-3.54	290.40
70	SAGBEND	-354.57	-101.07	.13	.00	.00	.00	.00	662.57	246.58	-17.33	247.19
71	SAGBEND	-366.77	-101.22	.05	5.17	-4.45	.00	.00	662.48	153.21	-46.35	160.07
72	SEABED	-378.97	-101.25	.00	21.95	-5.80	.00	.00	662.51	26.10	-47.33	54.05
73	SEABED	-391.17	-101.24	.00	18.14	2.63	.00	.00	662.52	-5.78	-5.16	7.75
74	SEABED	-403.37	-101.24	.00	15.16	.76	.00	.00	662.52	-2.33	2.13	3.15
75	SEABED	-415.57	-101.24	.00	14.99	-.06	.00	.00	662.52	.04	.56	.56
76	SEABED	-427.77	-101.24	.00	15.15	-.05	.00	.00	662.52	.15	-.06	.16
77	SEABED	-439.97	-101.24	.00	15.18	.00	.00	.00	662.52	.02	-.04	.04
78	SEABED	-452.17	-101.24	.00	15.18	.00	.00	.00	662.52	-.01	.00	.01
79	SEABED	-464.37	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
80	SEABED	-476.57	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
81	SEABED	-488.77	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
82	SEABED	-500.97	-101.24	.00	.00	.00	.00	.00	662.52	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.32	6.28	0.00	0.000	1.576	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.28	5.96	0.00	0.000	1.573	12.04	-0.0001	0.0000	-0.0136	-0.0001	0.0137	0.00
5	LAYBARGE	73.46	5.64	0.00	0.000	1.746	22.87	-0.0002	0.0000	-0.0112	0.0000	0.0114	0.00
7	TENSIONR	60.11	5.23	0.00	0.000	1.776	36.22	0.0088	0.0000	-0.0038	0.0000	0.0124	0.00
9	LAYBARGE	57.08	5.14	0.00	0.000	1.809	39.25	0.0088	0.0000	-0.0033	0.0000	0.0120	0.00
10	LAYBARGE	51.09	4.95	0.00	0.000	1.864	45.24	0.0088	0.0000	-0.0106	-0.0002	0.0192	0.00
11	LAYBARGE	46.45	4.79	0.00	0.000	2.049	49.89	0.0088	0.0000	-0.0320	-0.0002	0.0405	0.00
13	LAYBARGE	44.92	4.73	0.00	0.000	2.151	51.42	0.0088	0.0000	-0.0350	-0.0003	0.0436	0.00
14	TENSIONR	35.36	4.30	0.00	0.000	3.174	60.99	0.0170	0.0000	-0.0778	-0.0007	0.0944	0.00
16	LAYBARGE	23.35	3.42	0.00	-0.002	5.447	73.04	0.0170	0.0000	-0.1349	-0.0010	0.1506	0.00
18	LAYBARGE	8.90	1.61	0.00	0.000	8.868	87.61	0.0169	0.0000	-0.1658	-0.0018	0.1822	0.00
20	LAYBARGE	3.12	0.61	0.00	0.000	10.489	93.47	0.0168	0.0000	-0.2777	0.0024	0.2929	0.00
24	STINGER	-7.62	-1.66	0.00	0.000	13.142	104.46	0.0167	-0.0002	-0.1444	-0.0019	0.1592	0.00
26	STINGER	-16.49	-3.87	0.00	-0.003	15.132	113.60	0.0167	-0.0003	-0.1905	-0.0018	0.2066	0.00
29	STINGER	-26.12	-6.60	0.00	-0.005	16.285	123.63	0.0166	-0.0005	-0.0952	-0.0011	0.1105	0.00
32	STINGER	-34.85	-9.31	0.00	-0.007	17.192	132.77	0.0165	-0.0008	-0.1133	-0.0013	0.1289	0.00
35	STINGER	-44.31	-12.32	0.00	-0.009	18.136	142.66	0.0163	-0.0010	-0.1746	0.0014	0.1904	0.00
38	STINGER	-52.95	-15.24	0.00	-0.026	19.509	151.81	0.0161	-0.0012	-0.1763	-0.0034	0.1921	0.00
41	STINGER	-62.15	-18.72	0.01	0.022	21.721	161.63	0.0159	-0.0015	-0.1789	0.0110	0.1930	0.00
43	STINGER	-72.11	-22.92	0.01	-0.182	24.327	172.43	0.0156	-0.0018	-0.1650	-0.0392	0.1840	0.00
45	STINGER	-74.96	-24.23	0.02	-0.338	24.948	175.56	0.0155	-0.0019	-0.1281	-0.0313	0.1460	0.00
47	SAGBEND	-85.88	-29.50	0.13	-0.674	26.063	187.70	0.0151	-0.0023	-0.0396	-0.0124	0.0551	0.00
48	SAGBEND	-96.83	-34.88	0.26	-0.767	26.090	199.90	0.0148	-0.0027	0.0311	-0.0056	0.0460	0.00
49	SAGBEND	-107.81	-40.16	0.41	-0.726	25.559	212.10	0.0144	-0.0031	0.0469	0.0073	0.0620	0.00
50	SAGBEND	-118.86	-45.30	0.55	-0.637	24.715	224.30	0.0140	-0.0035	0.0543	0.0092	0.0694	0.00
51	SAGBEND	-129.98	-50.33	0.67	-0.561	23.734	236.50	0.0137	-0.0039	0.0599	0.0092	0.0748	0.00
52	SAGBEND	-141.20	-55.16	0.76	-0.465	22.733	248.70	0.0134	-0.0043	0.0614	0.0093	0.0766	0.00
53	SAGBEND	-152.50	-59.76	0.85	-0.349	21.666	260.90	0.0131	-0.0047	0.0605	0.0087	0.0747	0.00
54	SAGBEND	-163.88	-64.12	0.90	-0.284	20.522	273.10	0.0128	-0.0050	0.0594	0.0079	0.0743	0.00
55	SAGBEND	-175.34	-68.31	0.95	-0.194	19.480	285.30	0.0126	-0.0053	0.0621	0.0075	0.0765	0.00
56	SAGBEND	-186.87	-72.26	0.97	-0.106	18.367	297.50	0.0123	-0.0056	0.0625	0.0071	0.0760	0.00
57	SAGBEND	-198.50	-75.98	1.00	-0.043	17.166	309.70	0.0121	-0.0059	0.0616	0.0074	0.0748	0.00
58	SAGBEND	-210.19	-79.48	1.00	0.023	15.970	321.90	0.0119	-0.0062	0.0624	0.0076	0.0770	0.00
59	SAGBEND	-221.96	-82.73	0.99	0.088	14.748	334.10	0.0117	-0.0065	0.0638	0.0074	0.0787	0.00
60	SAGBEND	-233.79	-85.70	0.96	0.136	13.520	346.30	0.0115	-0.0067	0.0641	0.0072	0.0787	0.00
61	SAGBEND	-245.68	-88.41	0.91	0.196	12.367	358.50	0.0113	-0.0069	0.0643	0.0068	0.0781	0.00
62	SAGBEND	-257.63	-90.86	0.85	0.272	11.104	370.70	0.0112	-0.0071	0.0623	0.0069	0.0765	0.00
63	SAGBEND	-269.63	-93.05	0.80	0.334	9.786	382.89	0.0110	-0.0072	0.0645	0.0074	0.0786	0.00
64	SAGBEND	-281.67	-95.01	0.74	0.362	8.520	395.09	0.0109	-0.0074	0.0669	0.0076	0.0811	0.00
65	SAGBEND	-293.75	-96.67	0.66	0.395	7.317	407.29	0.0109	-0.0075	0.0651	0.0070	0.0786	0.00

66	SAGBEND	-305.87	-98.08	0.57	0.451	6.018	419.49	0.0108	-0.0076	0.0638	0.0077	0.0777	0.00
67	SAGBEND	-318.02	-99.25	0.47	0.486	4.715	431.69	0.0108	-0.0077	0.0674	0.0082	0.0805	0.00
68	SAGBEND	-330.19	-100.11	0.37	0.517	3.475	443.89	0.0107	-0.0078	0.0660	0.0066	0.0789	0.00
69	SAGBEND	-342.37	-100.69	0.26	0.537	2.220	456.09	0.0107	-0.0078	0.0602	-0.0062	0.0747	0.00
70	SAGBEND	-354.56	-101.04	0.17	0.497	1.156	468.29	0.0107	-0.0079	0.0502	-0.0089	0.0639	0.00
71	SAGBEND	-366.76	-101.21	0.08	0.364	0.470	480.49	0.0107	-0.0079	0.0334	-0.0149	0.0473	0.00
72	SEABED	-378.96	-101.27	0.02	0.167	0.107	492.69	0.0108	-0.0079	0.0187	-0.0123	0.0326	0.00
73	SEABED	-391.16	-101.27	0.00	0.037	-0.021	504.89	0.0108	-0.0079	0.0047	-0.0062	0.0217	0.00
74	SEABED	-403.36	-101.27	0.00	-0.006	-0.016	517.09	0.0108	-0.0079	-0.0013	-0.0015	0.0175	0.00
75	SEABED	-415.56	-101.27	0.00	-0.005	-0.005	529.29	0.0109	-0.0079	-0.0007	0.0004	0.0167	0.00
76	SEABED	-427.76	-101.27	0.00	-0.001	0.000	541.49	0.0109	-0.0079	-0.0002	0.0002	0.0164	0.00
77	SEABED	-439.96	-101.27	0.00	0.000	0.001	553.69	0.0109	-0.0079	0.0001	0.0001	0.0164	0.00
78	SEABED	-452.16	-101.27	0.00	0.000	0.000	565.89	0.0109	-0.0079	0.0000	0.0000	0.0163	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.32	6.28	0.00	16.91	0.09	0.00	0.00	0.00	4.67	-0.02	4.67
3	LAYBARGE	84.28	5.96	0.00	57.26	0.17	0.00	0.00	-6.04	-82.76	-0.41	82.76
5	LAYBARGE	73.46	5.64	0.00	50.91	-0.12	0.00	0.00	-11.50	-68.28	-0.25	68.28
7	TENSIONR	60.11	5.23	0.00	44.43	0.42	0.00	0.00	446.54	-22.82	-0.15	22.82
9	LAYBARGE	57.08	5.14	0.00	0.00	0.00	0.00	0.00	446.53	-19.99	-0.23	19.99
10	LAYBARGE	51.09	4.95	0.00	0.00	0.00	0.00	0.00	446.47	-64.26	-0.96	64.27
11	LAYBARGE	46.45	4.79	0.00	39.56	0.45	0.00	0.00	446.28	-194.11	-1.17	194.11
13	LAYBARGE	44.92	4.73	0.00	0.00	0.00	0.00	0.00	446.23	-212.40	-1.64	212.40
14	TENSIONR	35.36	4.30	0.00	76.74	0.30	0.00	0.00	864.19	-472.22	-4.38	472.22
16	LAYBARGE	23.35	3.42	0.00	132.34	1.17	0.00	0.00	863.10	-818.99	-6.12	818.99
18	LAYBARGE	8.90	1.61	0.00	158.70	-3.85	0.01	0.00	859.31	-1006.12	-11.04	1006.13
20	LAYBARGE	3.12	0.61	0.00	266.62	-6.23	0.06	0.00	855.39	-1483.03	14.58	1483.03
24	STINGER	-7.62	-1.66	0.00	138.84	-10.82	0.30	0.00	855.46	-876.25	-11.74	876.25
26	STINGER	-16.49	-3.87	0.00	170.16	-4.29	0.85	0.00	855.90	-1155.20	-10.92	1155.21
29	STINGER	-26.12	-6.60	0.00	77.91	-3.58	0.82	0.00	855.93	-577.75	-6.47	577.75
32	STINGER	-34.85	-9.31	0.00	272.17	-3.83	0.92	0.00	856.17	-687.88	-7.69	687.92
35	STINGER	-44.31	-12.32	0.00	276.76	2.63	0.88	0.00	853.81	-1059.31	8.79	1059.32
38	STINGER	-52.95	-15.24	0.00	180.02	-11.86	0.25	0.00	851.57	-1069.85	-20.67	1069.98
41	STINGER	-62.15	-18.72	0.01	153.94	35.39	0.00	0.00	846.30	-1085.54	66.60	1085.76
43	STINGER	-72.11	-22.92	0.01	131.45	-50.09	0.00	0.00	838.60	-1001.58	-237.86	1021.36
45	STINGER	-74.96	-24.23	0.02	0.00	0.00	0.55	0.02	837.38	-777.63	-189.72	791.87
47	SAGBEND	-85.88	-29.50	0.13	0.00	0.00	0.00	0.00	830.35	-240.33	-75.12	246.74
48	SAGBEND	-96.83	-34.88	0.26	0.00	0.00	0.00	0.00	822.18	189.02	-33.85	189.73
49	SAGBEND	-107.81	-40.16	0.41	0.00	0.00	0.00	0.00	813.99	284.87	44.34	286.69
50	SAGBEND	-118.86	-45.30	0.55	0.00	0.00	0.00	0.00	806.16	329.91	55.62	332.03
51	SAGBEND	-129.98	-50.33	0.67	0.00	0.00	0.00	0.00	799.56	363.71	55.55	365.36
52	SAGBEND	-141.20	-55.16	0.76	0.00	0.00	0.00	0.00	794.15	372.68	56.27	375.18
53	SAGBEND	-152.50	-59.76	0.85	0.00	0.00	0.00	0.00	788.90	367.16	52.70	369.17
54	SAGBEND	-163.88	-64.12	0.90	0.00	0.00	0.00	0.00	783.82	360.35	47.83	362.24
55	SAGBEND	-175.34	-68.31	0.95	0.00	0.00	0.00	0.00	778.87	376.80	45.32	377.93
56	SAGBEND	-186.87	-72.26	0.97	0.00	0.00	0.00	0.00	774.21	379.37	42.84	381.08
57	SAGBEND	-198.50	-75.98	1.00	0.00	0.00	0.00	0.00	769.95	373.85	44.80	375.03
58	SAGBEND	-210.19	-79.48	1.00	0.00	0.00	0.00	0.00	765.91	378.94	46.00	380.09
59	SAGBEND	-221.96	-82.73	0.99	0.00	0.00	0.00	0.00	762.14	387.09	44.92	388.27
60	SAGBEND	-233.79	-85.70	0.96	0.00	0.00	0.00	0.00	758.71	389.35	43.74	390.10
61	SAGBEND	-245.68	-88.41	0.91	0.00	0.00	0.00	0.00	755.66	390.54	41.38	391.01
62	SAGBEND	-257.63	-90.86	0.85	0.00	0.00	0.00	0.00	753.02	378.32	42.15	378.81
63	SAGBEND	-269.63	-93.05	0.80	0.00	0.00	0.00	0.00	750.76	391.30	45.09	393.43
64	SAGBEND	-281.67	-95.01	0.74	0.00	0.00	0.00	0.00	749.87	406.14	45.99	407.05
65	SAGBEND	-293.75	-96.67	0.66	0.00	0.00	0.00	0.00	749.56	395.45	42.22	396.74
66	SAGBEND	-305.87	-98.08	0.57	0.00	0.00	0.00	0.00	749.43	387.31	46.76	389.83
67	SAGBEND	-318.02	-99.25	0.47	0.00	0.00	0.00	0.00	749.47	409.05	49.68	410.81
68	SAGBEND	-330.19	-100.11	0.37	0.00	0.00	0.00	0.00	749.70	400.80	40.15	401.32
69	SAGBEND	-342.37	-100.69	0.26	0.00	0.00	0.00	0.00	750.18	365.71	-37.39	366.04
70	SAGBEND	-354.56	-101.04	0.17	4.40	-2.94	0.00	0.00	751.02	304.52	-54.22	304.59
71	SAGBEND	-366.76	-101.21	0.08	20.58	-11.67	0.00	0.00	752.27	202.99	-90.68	204.53
72	SEABED	-378.96	-101.27	0.02	24.19	-10.55	0.00	0.00	753.92	113.27	-74.46	118.97
73	SEABED	-391.16	-101.27	0.00	19.95	-3.52	0.00	0.00	755.49	28.36	-37.37	41.59
74	SEABED	-403.36	-101.27	0.00	17.54	1.63	0.00	0.00	757.01	-7.90	-9.24	9.80
75	SEABED	-415.56	-101.27	0.00	15.82	0.77	0.00	0.00	758.47	-4.02	2.64	4.18
76	SEABED	-427.76	-101.27	0.00	15.27	0.20	0.00	0.00	759.88	-1.50	1.32	1.73
77	SEABED	-439.96	-101.27	0.00	15.28	-0.11	0.00	0.00	761.22	0.39	0.53	0.54
78	SEABED	-452.16	-101.27	0.00	0.00	-0.02	0.00	0.00	762.48	0.00	0.00	0.00

Water Depth 101 m (180°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.95	.00	19.62	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	16.39	.00	-7.59	.00	22.84	5.10
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	16.37	.00	-6.61	.00	21.98	4.91
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	16.34	.00	-21.15	.00	34.32	7.66
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	16.31	.00	-64.73	.00	71.33	15.92
13	LAYBARGE	44.91	4.73	.00	.000	2.151	51.425	16.30	.00	-71.65	.00	77.20	17.23
14	TENSIONR	35.35	4.30	.00	.000	3.173	60.993	32.76	.00	-159.76	.00	168.56	37.62
16	LAYBARGE	23.34	3.42	.00	.000	5.432	73.039	32.57	.00	-261.42	.00	254.78	56.87
18	LAYBARGE	8.89	1.61	.00	.000	8.938	87.606	32.24	.00	-323.41	.00	307.14	68.56
20	LAYBARGE	3.11	.61	.00	.000	10.761	93.474	32.06	.00	-344.64	.00	325.00	72.55
24	STINGER	-7.62	-1.71	.00	.000	13.423	104.448	31.81	-.28	-200.61	.00	202.46	45.19
26	STINGER	-16.48	-3.96	.00	.000	15.059	113.592	31.51	-.64	-192.69	.00	195.62	43.66
29	STINGER	-26.11	-6.69	.00	.000	16.431	123.599	31.17	-1.07	-112.71	.00	127.51	28.46
32	STINGER	-34.86	-9.35	.00	.000	17.394	132.743	30.81	-1.50	-120.99	.00	134.41	30.00
35	STINGER	-44.25	-12.39	.00	.000	18.537	142.621	30.40	-1.99	-137.51	.00	148.29	33.10
38	STINGER	-52.89	-15.41	.00	.000	20.114	151.765	29.96	-2.47	-241.20	.00	236.23	52.73
41	STINGER	-62.04	-18.95	.00	.000	22.156	161.579	29.50	-3.04	-217.42	.00	215.84	48.18
43	STINGER	-71.97	-23.22	.00	.000	24.397	172.391	28.92	-3.73	-243.58	.00	237.84	53.09
45	STINGER	-74.83	-24.54	.00	.000	25.033	175.544	28.77	-3.94	-182.41	.00	185.81	41.48
47	SAGBEND	-85.78	-29.82	.00	.000	26.177	187.696	28.09	-4.79	-34.97	.00	60.35	13.47
48	SAGBEND	-96.72	-35.21	.00	.000	26.141	199.896	27.38	-5.65	32.44	.00	57.99	12.94
49	SAGBEND	-107.70	-40.53	.00	.000	25.560	212.096	26.66	-6.51	63.76	.00	84.30	18.82
50	SAGBEND	-118.74	-45.72	.00	.000	24.722	224.296	25.97	-7.34	78.92	.00	96.93	21.64
51	SAGBEND	-129.87	-50.73	.00	.000	23.756	236.496	25.30	-8.14	86.81	.00	103.40	23.08
52	SAGBEND	-141.08	-55.54	.00	.000	22.720	248.696	24.65	-8.92	91.43	.00	107.10	23.91
53	SAGBEND	-152.37	-60.15	.00	.000	21.640	260.896	24.04	-9.66	94.52	.00	109.53	24.45
54	SAGBEND	-163.76	-64.54	.00	.000	20.529	273.096	23.45	-10.36	96.89	.00	111.35	24.85
55	SAGBEND	-175.22	-68.70	.00	.000	19.393	285.296	22.90	-11.03	98.87	.00	112.85	25.19
56	SAGBEND	-186.77	-72.64	.00	.000	18.236	297.496	22.37	-11.66	100.62	.00	114.18	25.49
57	SAGBEND	-198.40	-76.34	.00	.000	17.059	309.696	21.88	-12.26	102.23	.00	115.39	25.76
58	SAGBEND	-210.10	-79.79	.00	.000	15.864	321.896	21.41	-12.81	103.71	.00	116.50	26.00
59	SAGBEND	-221.87	-83.00	.00	.000	14.653	334.096	20.99	-13.33	105.08	.00	117.53	26.23
60	SAGBEND	-233.70	-85.96	.00	.000	13.426	346.296	20.59	-13.80	106.34	.00	118.48	26.45
61	SAGBEND	-245.60	-88.67	.00	.000	12.186	358.496	20.23	-14.24	107.48	.00	119.34	26.64
62	SAGBEND	-257.55	-91.11	.00	.000	10.933	370.696	19.90	-14.63	108.49	.00	120.11	26.81
63	SAGBEND	-269.55	-93.29	.00	.000	9.669	382.896	19.61	-14.98	109.35	.00	120.75	26.95
64	SAGBEND	-281.60	-95.21	.00	.000	8.396	395.096	19.36	-15.29	110.01	.00	121.23	27.06
65	SAGBEND	-293.69	-96.86	.00	.000	7.117	407.297	19.14	-15.55	110.34	.00	121.45	27.11
66	SAGBEND	-305.81	-98.23	.00	.000	5.837	419.497	18.95	-15.77	110.14	.00	121.23	27.06
67	SAGBEND	-317.96	-99.34	.00	.000	4.565	431.697	18.80	-15.95	108.92	.00	120.16	26.82
68	SAGBEND	-330.13	-100.18	.00	.000	3.318	443.897	18.69	-16.08	105.69	.00	117.40	26.21
69	SAGBEND	-342.32	-100.75	.00	.000	2.128	456.098	18.62	-16.18	98.35	.00	111.19	24.82
70	SAGBEND	-354.52	-101.09	.00	.000	1.068	468.298	18.58	-16.23	82.47	.00	97.81	21.83
71	SAGBEND	-366.72	-101.23	.00	.000	.282	480.499	18.56	-16.25	48.71	.00	69.53	15.52
72	SEABED	-378.92	-101.25	.00	.000	-.012	492.699	18.56	-16.26	7.00	.00	35.54	7.93
73	SEABED	-391.12	-101.24	.00	.000	-.019	504.899	18.56	-16.25	-2.01	.00	31.70	7.07
74	SEABED	-403.32	-101.24	.00	.000	-.002	517.099	18.56	-16.25	-.68	.00	30.69	6.85
75	SEABED	-415.52	-101.24	.00	.000	.001	529.299	18.56	-16.25	.03	.00	30.20	6.74
76	SEABED	-427.72	-101.24	.00	.000	.000	541.499	18.56	-16.25	.05	.00	30.21	6.74
77	SEABED	-439.92	-101.24	.00	.000	.000	553.699	18.56	-16.25	.00	.00	30.18	6.74
78	SEABED	-452.12	-101.24	.00	.000	.000	565.899	18.56	-16.25	.00	.00	30.18	6.74
79	SEABED	-464.32	-101.24	.00	.000	.000	578.099	18.56	-16.25	.00	.00	30.17	6.74
80	SEABED	-476.52	-101.24	.00	.000	.000	590.299	18.56	-16.25	.00	.00	30.17	6.74
81	SEABED	-488.72	-101.24	.00	.000	.000	602.499	18.56	-16.25	.00	.00	30.17	6.74
82	SEABED	-500.92	-101.24	.00	.000	.000	614.699	18.56	-16.25	.00	.00	30.17	6.74

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.47	.00	.00	.00	-1.36	-77.24	.00	77.24
5	LAYBARGE	73.45	5.65	.00	50.06	.00	.00	.00	-2.64	-67.31	.00	67.31
7	TENSIONR	60.11	5.23	.00	43.31	.00	.00	.00	402.77	-22.26	.00	22.26
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	402.39	-19.37	.00	19.37
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	401.60	-62.02	.00	62.02
11	LAYBARGE	46.45	4.79	.00	36.92	.00	.00	.00	400.85	-189.82	.00	189.82
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	400.61	-210.10	.00	210.10
14	TENSIONR	35.35	4.30	.00	72.95	.00	.00	.00	805.31	-468.49	.00	468.49
16	LAYBARGE	23.34	3.42	.00	107.06	.00	.00	.00	800.66	-766.61	.00	766.61
18	LAYBARGE	8.89	1.61	.00	78.95	.00	.00	.00	792.49	-948.39	.00	948.39
20	LAYBARGE	3.11	.61	.00	104.65	.00	.00	.00	788.03	-1010.66	.00	1010.66
24	STINGER	-7.62	-1.71	.00	7.67	.00	.00	.00	785.33	-588.29	.00	588.29

26	STINGER	-16.48	-3.96	.00	53.71	.00	.00	.00	782.60	-565.07	.00	565.07
29	STINGER	-26.11	-6.69	.00	.00	.00	.01	.00	779.81	-330.52	.00	330.52
32	STINGER	-34.86	-9.35	.00	23.07	.00	.00	.00	776.45	-354.81	.00	354.81
35	STINGER	-44.25	-12.39	.00	.00	.00	.02	.00	772.56	-403.26	.00	403.26
38	STINGER	-52.89	-15.41	.00	76.84	.00	.00	.00	767.86	-707.32	.00	707.32
41	STINGER	-62.04	-18.95	.00	25.18	.00	.00	.00	763.72	-637.57	.00	637.57
43	STINGER	-71.97	-23.22	.00	91.69	.00	.00	.00	758.11	-714.29	.00	714.29
45	STINGER	-74.83	-24.54	.00	.00	.00	.53	.00	757.11	-534.90	.00	534.90
47	SAGBEND	-85.78	-29.82	.00	.00	.00	.00	.00	751.33	-102.55	.00	102.55
48	SAGBEND	-96.72	-35.21	.00	.00	.00	.00	.00	744.62	95.14	.00	95.14
49	SAGBEND	-107.70	-40.53	.00	.00	.00	.00	.00	737.93	186.99	.00	186.99
50	SAGBEND	-118.74	-45.72	.00	.00	.00	.00	.00	731.42	231.43	.00	231.43
51	SAGBEND	-129.87	-50.73	.00	.00	.00	.00	.00	725.16	254.57	.00	254.57
52	SAGBEND	-141.08	-55.54	.00	.00	.00	.00	.00	719.15	268.10	.00	268.10
53	SAGBEND	-152.37	-60.15	.00	.00	.00	.00	.00	713.41	277.19	.00	277.19
54	SAGBEND	-163.76	-64.54	.00	.00	.00	.00	.00	707.94	284.12	.00	284.12
55	SAGBEND	-175.22	-68.70	.00	.00	.00	.00	.00	702.75	289.92	.00	289.92
56	SAGBEND	-186.77	-72.64	.00	.00	.00	.00	.00	697.85	295.08	.00	295.08
57	SAGBEND	-198.40	-76.34	.00	.00	.00	.00	.00	693.24	299.78	.00	299.78
58	SAGBEND	-210.10	-79.79	.00	.00	.00	.00	.00	688.93	304.12	.00	304.12
59	SAGBEND	-221.87	-83.00	.00	.00	.00	.00	.00	684.93	308.14	.00	308.14
60	SAGBEND	-233.70	-85.96	.00	.00	.00	.00	.00	681.24	311.83	.00	311.83
61	SAGBEND	-245.60	-88.67	.00	.00	.00	.00	.00	677.87	315.18	.00	315.18
62	SAGBEND	-257.55	-91.11	.00	.00	.00	.00	.00	674.82	318.15	.00	318.15
63	SAGBEND	-269.55	-93.29	.00	.00	.00	.00	.00	672.11	320.68	.00	320.68
64	SAGBEND	-281.60	-95.21	.00	.00	.00	.00	.00	669.72	322.59	.00	322.59
65	SAGBEND	-293.69	-96.86	.00	.00	.00	.00	.00	667.67	323.58	.00	323.58
66	SAGBEND	-305.81	-98.23	.00	.00	.00	.00	.00	665.96	322.98	.00	322.98
67	SAGBEND	-317.96	-99.34	.00	.00	.00	.00	.00	664.59	319.41	.00	319.41
68	SAGBEND	-330.13	-100.18	.00	.00	.00	.00	.00	663.57	309.94	.00	309.94
69	SAGBEND	-342.32	-100.75	.00	.00	.00	.00	.00	662.88	288.41	.00	288.41
70	SAGBEND	-354.52	-101.09	.00	.00	.00	.00	.00	662.53	241.86	.00	241.86
71	SAGBEND	-366.72	-101.23	.00	6.54	.00	.00	.00	662.47	142.85	.00	142.85
72	SEABED	-378.92	-101.25	.00	22.17	.00	.00	.00	662.52	20.52	.00	20.52
73	SEABED	-391.12	-101.24	.00	17.75	.00	.00	.00	662.52	-5.90	.00	5.90
74	SEABED	-403.32	-101.24	.00	15.09	.00	.00	.00	662.52	-2.01	.00	2.01
75	SEABED	-415.52	-101.24	.00	15.01	.00	.00	.00	662.52	.09	.00	.09
76	SEABED	-427.72	-101.24	.00	15.16	.00	.00	.00	662.52	.13	.00	.13
77	SEABED	-439.92	-101.24	.00	15.18	.00	.00	.00	662.52	.01	.00	.01
78	SEABED	-452.12	-101.24	.00	15.18	.00	.00	.00	662.52	-.01	.00	.01
79	SEABED	-464.32	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
80	SEABED	-476.52	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
81	SEABED	-488.72	-101.24	.00	15.17	.00	.00	.00	662.52	.00	.00	.00
82	SEABED	-500.92	-101.24	.00	.00	.00	.00	.00	662.52	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.31	6.28	0.00	0.000	1.575	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.28	5.96	0.00	0.000	1.571	12.04	-0.0001	0.0000	-0.0136	0.0000	0.0137	0.00
5	LAYBARGE	73.45	5.65	0.00	0.000	1.744	22.87	-0.0001	0.0000	-0.0112	0.0000	0.0113	0.00
7	TENSIONR	60.10	5.23	0.00	0.000	1.774	36.22	0.0088	0.0000	-0.0037	0.0000	0.0124	0.00
9	LAYBARGE	57.08	5.14	0.00	0.000	1.807	39.25	0.0088	0.0000	-0.0033	0.0000	0.0120	0.00
10	LAYBARGE	51.09	4.95	0.00	0.000	1.862	45.24	0.0088	0.0000	-0.0105	0.0000	0.0191	0.00
11	LAYBARGE	46.45	4.79	0.00	0.000	2.047	49.89	0.0088	0.0000	-0.0317	0.0000	0.0403	0.00
13	LAYBARGE	44.91	4.73	0.00	0.000	2.148	51.42	0.0088	0.0000	-0.0350	0.0000	0.0436	0.00
14	TENSIONR	35.36	4.30	0.00	0.000	3.169	60.99	0.0169	0.0000	-0.0778	0.0000	0.0944	0.00
16	LAYBARGE	23.35	3.42	0.00	0.000	5.427	73.04	0.0168	0.0000	-0.1322	0.0000	0.1472	0.00
18	LAYBARGE	8.90	1.62	0.00	0.000	8.907	87.61	0.0168	0.0000	-0.1651	0.0000	0.1812	0.00
20	LAYBARGE	3.11	0.61	0.00	0.000	10.491	93.47	0.0167	0.0000	-0.2419	0.0000	0.2580	0.00
24	STINGER	-7.61	-1.63	0.00	0.000	13.070	104.45	0.0166	-0.0001	-0.1305	0.0000	0.1452	0.00
26	STINGER	-16.48	-3.82	0.00	0.000	14.903	113.59	0.0165	-0.0003	-0.1783	0.0000	0.1933	0.00
29	STINGER	-26.12	-6.54	0.00	0.000	16.167	123.62	0.0164	-0.0005	-0.1059	0.0000	0.1205	0.00
32	STINGER	-34.88	-9.21	0.00	0.000	17.106	132.77	0.0163	-0.0007	-0.1287	0.0000	0.1450	0.00
35	STINGER	-44.33	-12.16	0.00	0.000	18.261	142.66	0.0161	-0.0010	-0.1829	0.0000	0.1985	0.00
38	STINGER	-52.97	-15.17	0.00	0.000	19.948	151.81	0.0159	-0.0012	-0.1738	0.0000	0.1890	0.00
41	STINGER	-62.13	-18.74	0.00	0.000	22.005	161.63	0.0156	-0.0015	-0.1629	-0.0001	0.1770	0.00
43	STINGER	-72.05	-22.98	0.00	0.000	24.590	172.44	0.0153	-0.0018	-0.1633	0.0005	0.1775	0.00
45	STINGER	-74.90	-24.29	0.00	0.000	25.152	175.56	0.0152	-0.0019	-0.1270	0.0004	0.1417	0.00
47	SAGBEND	-85.80	-29.55	0.00	0.000	26.260	187.70	0.0149	-0.0023	-0.0399	-0.0002	0.0541	0.00
48	SAGBEND	-96.76	-34.91	0.00	0.000	26.302	199.90	0.0145	-0.0027	0.0351	-0.0002	0.0499	0.00
49	SAGBEND	-107.76	-40.20	0.00	-0.001	25.679	212.10	0.0142	-0.0032	0.0499	-0.0002	0.0638	0.00
50	SAGBEND	-118.80	-45.38	0.00	-0.001	24.808	224.30	0.0139	-0.0036	0.0593	-0.0003	0.0729	0.00
51	SAGBEND	-129.92	-50.40	0.00	0.000	23.825	236.50	0.0136	-0.0039	0.0659	0.0002	0.0794	0.00
52	SAGBEND	-141.14	-55.20	0.00	-0.001	22.803	248.70	0.0133	-0.0043	0.0610	0.0002	0.0750	0.00
53	SAGBEND	-152.43	-59.84	0.00	-0.001	21.646	260.90	0.0130	-0.0047	0.0601	0.0002	0.0750	0.00
54	SAGBEND	-163.81	-64.28	0.00	0.000	20.533	273.10	0.0128	-0.0050	0.0624	0.0002	0.0771	0.00
55	SAGBEND	-175.26	-68.45	0.00	0.001	19.562	285.30	0.0125	-0.0053	0.0663	0.0002	0.0798	0.00
56	SAGBEND	-186.81	-72.39	0.00	0.001	18.421	297.50	0.0123	-0.0056	0.0645	0.0002	0.0773	0.00
57	SAGBEND	-198.44	-76.06	0.00	0.000	17.208	309.70	0.0120	-0.0059	0.0626	-0.0002	0.0757	0.00
58	SAGBEND	-210.13	-79.52	0.00	0.000	15.924	321.90	0.0118	-0.0062	0.0663	-0.0002	0.0793	0.00
59	SAGBEND	-221.90	-82.75	0.00	0.000	14.662	334.10	0.0116	-0.0065	0.0670	-0.0002	0.0815	0.00
60	SAGBEND	-233.73	-85.74	0.00	0.000	13.510	346.30	0.0114	-0.0067	0.0676	0.0002	0.0820	0.00
61	SAGBEND	-245.62	-88.46	0.00	0.000	12.321	358.50	0.0112	-0.0069	0.0649	0.0002	0.0786	0.00
62	SAGBEND	-257.57	-90.90	0.00	0.000	11.058	370.70	0.0111	-0.0071	0.0621	0.0002	0.0759	0.00
63	SAGBEND	-269.57	-93.12	0.00	0.001	9.719	382.90	0.0110	-0.0073	0.0663	0.0002	0.0805	0.00
64	SAGBEND	-281.62	-95.05	0.00	0.001	8.512	395.10	0.0109	-0.0074	0.0695	-0.0002	0.0837	0.00
65	SAGBEND	-293.69	-96.68	0.00	0.001	7.356	407.30	0.0108	-0.0075	0.0666	0.0002	0.0807	0.00

66	SAGBEND	-305.82	-98.07	0.00	0.001	6.026	419.50	0.0107	-0.0076	0.0632	-0.0003	0.0759	0.00
67	SAGBEND	-317.96	-99.24	0.00	0.000	4.691	431.70	0.0107	-0.0077	0.0695	-0.0003	0.0815	0.00
68	SAGBEND	-330.13	-100.11	0.00	0.001	3.531	443.89	0.0107	-0.0078	0.0690	0.0003	0.0813	0.00
69	SAGBEND	-342.32	-100.69	0.00	0.000	2.248	456.09	0.0107	-0.0078	0.0613	-0.0002	0.0740	0.00
70	SAGBEND	-354.51	-101.03	0.00	0.000	1.141	468.29	0.0107	-0.0079	0.0530	0.0002	0.0656	0.00
71	SAGBEND	-366.71	-101.20	0.00	0.000	0.479	480.49	0.0107	-0.0079	0.0329	0.0003	0.0471	0.00
72	SEABED	-378.91	-101.27	0.00	0.001	0.126	492.69	0.0107	-0.0079	0.0194	-0.0002	0.0328	0.00
73	SEABED	-391.11	-101.27	0.00	0.000	-0.016	504.89	0.0107	-0.0079	0.0055	-0.0001	0.0194	0.00
74	SEABED	-403.31	-101.27	0.00	0.000	-0.016	517.09	0.0107	-0.0079	-0.0013	0.0000	0.0170	0.00
75	SEABED	-415.51	-101.27	0.00	0.000	-0.005	529.29	0.0107	-0.0079	-0.0007	0.0000	0.0166	0.00
76	SEABED	-427.71	-101.27	0.00	0.000	0.000	541.49	0.0108	-0.0079	-0.0003	0.0000	0.0163	0.00
77	SEABED	-439.91	-101.27	0.00	0.000	0.001	553.70	0.0108	-0.0079	0.0001	0.0000	0.0162	0.00
78	SEABED	-452.11	-101.27	0.00	0.000	0.000	565.90	0.0108	-0.0079	0.0000	0.0000	0.0162	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	0.00	16.83	0.00	0.00	0.00	0.00	4.65	0.00	4.65
3	LAYBARGE	84.28	5.96	0.00	57.10	-0.01	0.00	0.00	-3.82	-82.73	0.01	82.73
5	LAYBARGE	73.45	5.65	0.00	50.49	-0.01	0.00	0.00	-7.33	-68.13	0.00	68.13
7	TENSIONR	60.10	5.23	0.00	43.70	-0.01	0.00	0.00	445.61	-22.64	0.00	22.64
9	LAYBARGE	57.08	5.14	0.00	0.00	0.00	0.00	0.00	445.73	-20.05	0.00	20.05
10	LAYBARGE	51.09	4.95	0.00	0.00	0.00	0.00	0.00	445.89	-63.75	0.02	63.75
11	LAYBARGE	46.45	4.79	0.00	38.21	-0.01	0.00	0.00	445.86	-192.19	0.02	192.19
13	LAYBARGE	44.91	4.73	0.00	0.00	0.00	0.00	0.00	445.85	-212.32	0.03	212.32
14	TENSIONR	35.36	4.30	0.00	75.94	0.00	0.00	0.00	858.81	-472.35	0.09	472.35
16	LAYBARGE	23.35	3.42	0.00	122.90	-0.01	0.00	0.00	856.87	-802.43	0.13	802.43
18	LAYBARGE	8.90	1.62	0.00	152.68	0.01	0.00	0.00	852.57	-1002.03	0.17	1002.03
20	LAYBARGE	3.11	0.61	0.00	234.45	-0.02	0.05	0.00	848.54	-1401.76	0.18	1401.76
24	STINGER	-7.61	-1.63	0.00	107.76	-0.03	0.19	0.00	849.56	-792.05	0.16	792.05
26	STINGER	-16.48	-3.82	0.00	158.04	0.02	0.55	0.00	849.27	-1081.79	-0.15	1081.79
29	STINGER	-26.12	-6.54	0.00	112.86	-0.02	0.53	0.00	848.80	-642.88	0.11	642.88
32	STINGER	-34.88	-9.21	0.00	155.09	0.03	0.78	0.00	846.35	-780.98	0.13	780.98
35	STINGER	-44.33	-12.16	0.00	204.08	0.06	0.75	0.00	842.11	-1109.64	0.14	1109.64
38	STINGER	-52.97	-15.17	0.00	152.66	0.14	0.21	0.00	838.63	-1054.62	0.24	1054.62
41	STINGER	-62.13	-18.74	0.00	128.91	-0.47	0.03	0.00	833.13	-988.93	-0.87	988.93
43	STINGER	-72.05	-22.98	0.00	130.96	0.65	0.00	0.00	825.29	-991.24	3.07	991.24
45	STINGER	-74.90	-24.29	0.00	0.00	0.00	0.55	0.00	824.10	-771.00	2.39	771.00
47	SAGBEND	-85.80	-29.55	0.00	0.00	0.00	0.00	0.00	817.45	-242.10	-1.09	242.10
48	SAGBEND	-96.76	-34.91	0.00	0.00	0.00	0.00	0.00	809.88	212.84	-1.08	212.84
49	SAGBEND	-107.76	-40.20	0.00	0.00	0.00	0.00	0.00	804.85	302.71	-1.39	302.71
50	SAGBEND	-118.80	-45.38	0.00	0.00	0.00	0.00	0.00	799.76	360.04	-1.53	360.04
51	SAGBEND	-129.92	-50.40	0.00	0.00	0.00	0.00	0.00	794.79	399.79	1.48	399.79
52	SAGBEND	-141.14	-55.20	0.00	0.00	0.00	0.00	0.00	789.94	370.34	1.39	370.34
53	SAGBEND	-152.43	-59.84	0.00	0.00	0.00	0.00	0.00	785.10	364.71	1.12	364.71
54	SAGBEND	-163.81	-64.28	0.00	0.00	0.00	0.00	0.00	780.26	378.66	1.07	378.66
55	SAGBEND	-175.26	-68.45	0.00	0.00	0.00	0.00	0.00	775.42	402.60	1.07	402.60
56	SAGBEND	-186.81	-72.39	0.00	0.00	0.00	0.00	0.00	770.63	391.26	1.29	391.26
57	SAGBEND	-198.44	-76.06	0.00	0.00	0.00	0.00	0.00	765.92	379.79	-1.45	379.79
58	SAGBEND	-210.13	-79.52	0.00	0.00	0.00	0.00	0.00	761.39	402.28	-1.47	402.28
59	SAGBEND	-221.90	-82.75	0.00	0.00	0.00	0.00	0.00	757.08	406.85	-1.46	406.85
60	SAGBEND	-233.73	-85.74	0.00	0.00	0.00	0.00	0.00	754.21	410.06	1.41	410.06
61	SAGBEND	-245.62	-88.46	0.00	0.00	0.00	0.00	0.00	751.97	393.81	1.43	393.81
62	SAGBEND	-257.57	-90.90	0.00	0.00	0.00	0.00	0.00	750.14	376.88	1.31	376.88
63	SAGBEND	-269.57	-93.12	0.00	0.00	0.00	0.00	0.00	748.71	402.32	1.24	402.32
64	SAGBEND	-281.62	-95.05	0.00	0.00	0.00	0.00	0.00	747.65	421.99	-1.07	421.99
65	SAGBEND	-293.69	-96.68	0.00	0.00	0.00	0.00	0.00	746.94	404.22	1.20	404.22
66	SAGBEND	-305.82	-98.07	0.00	0.00	0.00	0.00	0.00	746.57	383.89	-1.63	383.89
67	SAGBEND	-317.96	-99.24	0.00	0.00	0.00	0.00	0.00	746.52	421.65	-1.81	421.65
68	SAGBEND	-330.13	-100.11	0.00	0.00	0.00	0.00	0.00	746.77	418.58	1.85	418.58
69	SAGBEND	-342.32	-100.69	0.00	0.00	0.00	0.00	0.00	747.27	371.85	-1.19	371.85
70	SAGBEND	-354.51	-101.03	0.00	5.13	0.21	0.00	0.00	748.01	322.02	1.06	322.02
71	SAGBEND	-366.71	-101.20	0.00	21.26	-0.31	0.00	0.00	748.98	200.00	1.82	200.00
72	SEABED	-378.91	-101.27	0.00	23.94	-0.19	0.00	0.00	750.10	117.74	-1.31	117.74
73	SEABED	-391.11	-101.27	0.00	20.13	0.07	0.00	0.00	751.17	33.26	-0.53	33.26
74	SEABED	-403.31	-101.27	0.00	17.62	0.03	0.00	0.00	752.18	-7.76	-0.12	7.76
75	SEABED	-415.51	-101.27	0.00	15.94	0.01	0.00	0.00	753.16	-4.09	0.07	4.09
76	SEABED	-427.71	-101.27	0.00	15.26	0.01	0.00	0.00	754.09	-1.58	0.03	1.58
77	SEABED	-439.91	-101.27	0.00	15.24	0.01	0.00	0.00	754.97	0.33	0.04	0.33
78	SEABED	-452.11	-101.27	0.00	0.00	0.00	0.00	0.00	755.80	0.00	0.00	0.00

LAMPIRAN C-3

HASIL *OUTPUT SOFTWARE OFFPIPE*

(*WATER DEPTH* = 91 M)

Water Depth 91 m (0°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.96	.00	19.62	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	13.79	.00	-7.59	.00	20.25	4.52
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	13.78	.00	-6.62	.00	19.41	4.33
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	13.74	.00	-21.15	.00	31.72	7.08
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	13.71	.00	-64.58	.00	68.61	15.31
13	LAYBARGE	44.91	4.73	.00	.000	2.150	51.425	13.70	.00	-71.63	.00	74.59	16.65
14	TENSIONR	35.35	4.30	.00	.000	3.173	60.993	27.57	.00	-159.80	.00	163.40	36.47
16	LAYBARGE	23.34	3.42	.00	.000	5.426	73.039	27.39	.00	-258.23	.00	246.89	55.11
18	LAYBARGE	8.89	1.61	.00	.000	8.956	87.606	27.05	.00	-324.58	.00	302.95	67.62
20	LAYBARGE	3.11	.61	.00	.000	10.718	93.474	26.89	.00	-320.02	.00	298.91	66.72
24	STINGER	-7.61	-1.69	.00	.000	13.220	104.440	26.63	-.27	-190.35	.00	188.56	42.09
26	STINGER	-16.49	-3.90	.00	.000	14.713	113.584	26.34	-.63	-167.47	.00	169.00	37.72
29	STINGER	-26.13	-6.54	.00	.000	15.885	123.587	26.01	-1.05	-93.23	.00	105.78	23.61
32	STINGER	-34.91	-9.11	.00	.000	16.653	132.731	25.66	-1.46	-93.79	.00	106.12	23.69
35	STINGER	-44.35	-12.02	.00	.000	17.706	142.611	25.26	-1.93	-143.81	.00	148.48	33.14
38	STINGER	-53.02	-14.92	.00	.000	19.450	151.755	24.82	-2.39	-272.69	.00	257.81	57.55
41	STINGER	-62.23	-18.38	.00	.000	21.763	161.594	24.38	-2.95	-242.09	.00	231.64	51.71
43	STINGER	-72.18	-22.61	.00	.000	24.353	172.404	23.79	-3.63	-286.78	.00	269.38	60.13
45	STINGER	-75.03	-23.93	.00	.000	25.107	175.548	23.65	-3.84	-219.00	.00	211.74	47.26
47	SAGBEND	-85.95	-29.25	.00	.000	26.533	187.696	22.98	-4.70	-48.47	.00	66.65	14.88
48	SAGBEND	-96.86	-34.72	.00	.000	26.553	199.896	22.25	-5.57	35.09	.00	55.08	12.29
49	SAGBEND	-107.80	-40.11	.00	.000	25.879	212.096	21.53	-6.44	76.45	.00	89.90	20.07
50	SAGBEND	-118.82	-45.34	.00	.000	24.856	224.296	20.83	-7.28	97.47	.00	107.50	24.00
51	SAGBEND	-129.95	-50.36	.00	.000	23.654	236.496	20.15	-8.08	108.64	.00	116.75	26.06
52	SAGBEND	-141.17	-55.13	.00	.000	22.353	248.696	19.52	-8.85	115.01	.00	121.94	27.22
53	SAGBEND	-152.51	-59.63	.00	.000	20.994	260.896	18.91	-9.57	119.04	.00	125.16	27.94
54	SAGBEND	-163.95	-63.86	.00	.000	19.595	273.096	18.35	-10.25	121.90	.00	127.40	28.44
55	SAGBEND	-175.50	-67.81	.00	.000	18.167	285.296	17.82	-10.89	124.16	.00	129.15	28.83
56	SAGBEND	-187.14	-71.47	.00	.000	16.715	297.496	17.33	-11.47	126.09	.00	130.62	29.16
57	SAGBEND	-198.86	-74.83	.00	.000	15.242	309.696	16.88	-12.01	127.79	.00	131.92	29.45
58	SAGBEND	-210.68	-77.88	.00	.000	13.751	321.896	16.48	-12.50	129.30	.00	133.07	29.70
59	SAGBEND	-222.56	-80.63	.00	.000	12.243	334.096	16.11	-12.94	130.60	.00	134.06	29.92
60	SAGBEND	-234.52	-83.05	.00	.000	10.721	346.296	15.78	-13.33	131.65	.00	134.85	30.10
61	SAGBEND	-246.53	-85.16	.00	.000	9.189	358.497	15.50	-13.67	132.31	.00	135.32	30.20
62	SAGBEND	-258.60	-86.95	.00	.000	7.653	370.697	15.26	-13.96	132.34	.00	135.27	30.20
63	SAGBEND	-270.71	-88.41	.00	.000	6.122	382.897	15.07	-14.19	131.28	.00	134.32	29.98
64	SAGBEND	-282.86	-89.55	.00	.000	4.614	395.097	14.92	-14.38	128.24	.00	131.70	29.40
65	SAGBEND	-295.03	-90.38	.00	.000	3.161	407.298	14.81	-14.51	121.44	.00	125.92	28.11
66	SAGBEND	-307.22	-90.91	.00	.000	1.823	419.498	14.74	-14.59	107.41	.00	114.04	25.46
67	SAGBEND	-319.42	-91.17	.00	.000	.721	431.699	14.71	-14.64	79.31	.00	90.34	20.17
68	SEABED	-331.62	-91.25	.00	.000	.082	443.899	14.71	-14.65	27.76	.00	47.36	10.57
69	SEABED	-343.82	-91.25	.00	.000	-.033	456.100	14.71	-14.65	-.54	.00	25.83	5.77
70	SEABED	-356.02	-91.24	.00	.000	-.009	468.300	14.71	-14.65	-1.77	.00	26.74	5.97
71	SEABED	-368.22	-91.24	.00	.000	.001	480.500	14.71	-14.65	-.19	.00	25.57	5.71
72	SEABED	-380.42	-91.24	.00	.000	.001	492.700	14.71	-14.65	.08	.00	25.49	5.69
73	SEABED	-392.62	-91.24	.00	.000	.000	504.900	14.71	-14.65	.02	.00	25.44	5.68
74	SEABED	-404.82	-91.24	.00	.000	.000	517.100	14.71	-14.65	.00	.00	25.43	5.68
75	SEABED	-417.02	-91.24	.00	.000	.000	529.300	14.71	-14.65	.00	.00	25.43	5.68
76	SEABED	-429.22	-91.24	.00	.000	.000	541.500	14.71	-14.65	.00	.00	25.42	5.68
77	SEABED	-441.42	-91.24	.00	.000	.000	553.700	14.71	-14.65	.00	.00	25.42	5.68
78	SEABED	-453.62	-91.24	.00	.000	.000	565.900	14.71	-14.65	.00	.00	25.42	5.68

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.47	.00	.00	.00	-1.36	-77.24	.00	77.24
5	LAYBARGE	73.45	5.65	.00	50.06	.00	.00	.00	-2.64	-67.32	.00	67.32
7	TENSIONR	60.11	5.23	.00	43.26	.00	.00	.00	339.02	-22.26	.00	22.26
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	338.63	-19.42	.00	19.42
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	337.84	-62.01	.00	62.01
11	LAYBARGE	46.45	4.79	.00	36.23	.00	.00	.00	337.09	-189.38	.00	189.38
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	336.85	-210.05	.00	210.05
14	TENSIONR	35.35	4.30	.00	70.64	.00	.00	.00	677.79	-468.60	.00	468.60
16	LAYBARGE	23.34	3.42	.00	98.70	.00	.00	.00	673.19	-757.27	.00	757.27
18	LAYBARGE	8.89	1.61	.00	86.99	.00	.00	.00	664.95	-951.84	.00	951.84
20	LAYBARGE	3.11	.61	.00	81.05	.00	.00	.00	660.91	-938.47	.00	938.47
24	STINGER	-7.61	-1.69	.00	10.65	.00	.00	.00	657.93	-558.21	.00	558.21
26	STINGER	-16.49	-3.90	.00	41.91	.00	.00	.00	655.38	-491.10	.00	491.10
29	STINGER	-26.13	-6.54	.00	.00	.00	.00	.00	652.56	-273.40	.00	273.40
32	STINGER	-34.91	-9.11	.00	6.75	.00	.00	.00	649.37	-275.04	.00	275.04
35	STINGER	-44.35	-12.02	.00	.00	.00	.03	.00	645.46	-421.72	.00	421.72

38	STINGER	-53.02	-14.92	.00	86.01	.00	.00	.00	640.55	-799.66	.00	799.66
41	STINGER	-62.23	-18.38	.00	17.35	.00	.00	.00	636.62	-709.92	.00	709.92
43	STINGER	-72.18	-22.61	.00	103.11	.00	.00	.00	630.78	-840.98	.00	840.98
45	STINGER	-75.03	-23.93	.00	.00	.00	.51	.00	629.99	-642.22	.00	642.22
47	SAGBEND	-85.95	-29.25	.00	.00	.00	.00	.00	624.48	-142.12	.00	142.12
48	SAGBEND	-96.86	-34.72	.00	.00	.00	.00	.00	617.70	102.89	.00	102.89
49	SAGBEND	-107.80	-40.11	.00	.00	.00	.00	.00	610.88	224.18	.00	224.18
50	SAGBEND	-118.82	-45.34	.00	.00	.00	.00	.00	604.28	285.84	.00	285.84
51	SAGBEND	-129.95	-50.36	.00	.00	.00	.00	.00	597.99	318.59	.00	318.59
52	SAGBEND	-141.17	-55.13	.00	.00	.00	.00	.00	592.02	337.27	.00	337.27
53	SAGBEND	-152.51	-59.63	.00	.00	.00	.00	.00	586.40	349.07	.00	349.07
54	SAGBEND	-163.95	-63.86	.00	.00	.00	.00	.00	581.12	357.47	.00	357.47
55	SAGBEND	-175.50	-67.81	.00	.00	.00	.00	.00	576.19	364.10	.00	364.10
56	SAGBEND	-187.14	-71.47	.00	.00	.00	.00	.00	571.63	369.74	.00	369.74
57	SAGBEND	-198.86	-74.83	.00	.00	.00	.00	.00	567.44	374.73	.00	374.73
58	SAGBEND	-210.68	-77.88	.00	.00	.00	.00	.00	563.63	379.16	.00	379.16
59	SAGBEND	-222.56	-80.63	.00	.00	.00	.00	.00	560.21	382.99	.00	382.99
60	SAGBEND	-234.52	-83.05	.00	.00	.00	.00	.00	557.18	386.05	.00	386.05
61	SAGBEND	-246.53	-85.16	.00	.00	.00	.00	.00	554.56	387.98	.00	387.98
62	SAGBEND	-258.60	-86.95	.00	.00	.00	.00	.00	552.33	388.08	.00	388.08
63	SAGBEND	-270.71	-88.41	.00	.00	.00	.00	.00	550.52	384.99	.00	384.99
64	SAGBEND	-282.86	-89.55	.00	.00	.00	.00	.00	549.12	376.07	.00	376.07
65	SAGBEND	-295.03	-90.38	.00	.00	.00	.00	.00	548.14	356.13	.00	356.13
66	SAGBEND	-307.22	-90.91	.00	.00	.00	.00	.00	547.56	314.99	.00	314.99
67	SAGBEND	-319.42	-91.17	.00	.57	.00	.00	.00	547.36	232.59	.00	232.59
68	SEABED	-331.62	-91.25	.00	17.85	.00	.00	.00	547.41	81.42	.00	81.42
69	SEABED	-343.82	-91.25	.00	21.56	.00	.00	.00	547.43	-1.60	.00	1.60
70	SEABED	-356.02	-91.24	.00	15.94	.00	.00	.00	547.43	-5.19	.00	5.19
71	SEABED	-368.22	-91.24	.00	14.88	.00	.00	.00	547.43	-.56	.00	.56
72	SEABED	-380.42	-91.24	.00	15.09	.00	.00	.00	547.43	.25	.00	.25
73	SEABED	-392.62	-91.24	.00	15.18	.00	.00	.00	547.43	.07	.00	.07
74	SEABED	-404.82	-91.24	.00	15.18	.00	.00	.00	547.43	-.01	.00	.01
75	SEABED	-417.02	-91.24	.00	15.18	.00	.00	.00	547.43	.00	.00	.00
76	SEABED	-429.22	-91.24	.00	15.17	.00	.00	.00	547.43	.00	.00	.00
77	SEABED	-441.42	-91.24	.00	15.18	.00	.00	.00	547.43	.00	.00	.00
78	SEABED	-453.62	-91.24	.00	.00	.00	.00	.00	547.43	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.31	6.28	0.00	0.000	1.574	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.27	5.96	0.00	0.000	1.570	12.04	-0.0001	0.0000	-0.0137	0.0000	0.0137	0.00
5	LAYBARGE	73.45	5.64	0.00	0.000	1.743	22.87	-0.0002	0.0000	-0.0112	0.0000	0.0114	0.00
7	TENSIONR	60.10	5.23	0.00	0.000	1.773	36.22	0.0074	0.0000	-0.0037	0.0000	0.0111	0.00
9	LAYBARGE	57.08	5.14	0.00	0.000	1.806	39.25	0.0074	0.0000	-0.0033	0.0000	0.0106	0.00
10	LAYBARGE	51.08	4.95	0.00	0.000	1.860	45.24	0.0074	0.0000	-0.0106	0.0000	0.0178	0.00
11	LAYBARGE	46.44	4.79	0.00	0.000	2.045	49.89	0.0074	0.0000	-0.0319	0.0000	0.0389	0.00
13	LAYBARGE	44.91	4.73	0.00	0.000	2.147	51.42	0.0074	0.0000	-0.0351	0.0000	0.0422	0.00
14	TENSIONR	35.35	4.30	0.00	0.000	3.167	60.99	0.0142	0.0000	-0.0783	0.0000	0.0923	0.00
16	LAYBARGE	23.34	3.42	0.00	0.000	5.433	73.04	0.0142	0.0000	-0.1323	0.0000	0.1448	0.00
18	LAYBARGE	8.89	1.61	0.00	0.000	8.916	87.61	0.0141	0.0000	-0.1642	0.0000	0.1780	0.00
20	LAYBARGE	3.11	0.61	0.00	0.000	10.567	93.47	0.0140	0.0000	-0.2760	0.0000	0.2896	0.00
24	STINGER	-7.61	-1.67	0.00	0.000	13.175	104.43	0.0139	-0.0001	-0.1323	0.0000	0.1452	0.00
26	STINGER	-16.48	-3.88	0.00	0.000	14.911	113.58	0.0138	-0.0003	-0.1737	0.0000	0.1862	0.00
29	STINGER	-26.08	-6.57	0.00	0.000	16.089	123.59	0.0137	-0.0005	-0.0893	0.0000	0.1014	0.00
32	STINGER	-34.84	-9.19	0.00	0.000	16.996	132.74	0.0136	-0.0007	-0.1002	0.0000	0.1137	0.00
35	STINGER	-44.34	-12.15	0.00	0.000	17.750	142.64	0.0134	-0.0010	-0.1396	0.0000	0.1528	0.00
38	STINGER	-53.00	-15.03	0.00	0.000	19.270	151.78	0.0132	-0.0012	-0.1754	0.0000	0.1879	0.00
41	STINGER	-62.22	-18.47	0.00	0.000	21.676	161.62	0.0130	-0.0014	-0.1968	-0.0001	0.2097	0.00
43	STINGER	-72.17	-22.73	0.00	0.000	24.479	172.42	0.0127	-0.0018	-0.1714	0.0004	0.1847	0.00
45	STINGER	-75.02	-24.05	0.00	0.001	25.216	175.56	0.0127	-0.0019	-0.1339	0.0003	0.1470	0.00
47	SAGBEND	-85.94	-29.38	0.00	0.001	26.627	187.70	0.0123	-0.0023	-0.0410	0.0002	0.0538	0.00
48	SAGBEND	-96.84	-34.84	0.00	0.000	26.580	199.90	0.0120	-0.0027	0.0321	-0.0002	0.0448	0.00
49	SAGBEND	-107.77	-40.24	0.00	0.001	25.896	212.10	0.0116	-0.0032	0.0516	-0.0002	0.0642	0.00
50	SAGBEND	-118.78	-45.47	0.00	0.000	24.892	224.30	0.0113	-0.0036	0.0626	-0.0002	0.0750	0.00
51	SAGBEND	-129.91	-50.46	0.00	-0.001	23.627	236.50	0.0110	-0.0039	0.0683	0.0002	0.0808	0.00
52	SAGBEND	-141.15	-55.21	0.00	0.000	22.316	248.70	0.0107	-0.0043	0.0687	-0.0002	0.0804	0.00
53	SAGBEND	-152.49	-59.72	0.00	0.000	20.917	260.90	0.0104	-0.0047	0.0695	-0.0001	0.0811	0.00
54	SAGBEND	-163.92	-63.97	0.00	0.000	19.552	273.10	0.0101	-0.0050	0.0703	0.0001	0.0818	0.00
55	SAGBEND	-175.47	-67.92	0.00	0.000	18.164	285.30	0.0099	-0.0053	0.0720	-0.0002	0.0828	0.00
56	SAGBEND	-187.11	-71.58	0.00	0.000	16.733	297.50	0.0096	-0.0056	0.0731	-0.0002	0.0837	0.00
57	SAGBEND	-198.85	-74.95	0.00	0.000	15.217	309.70	0.0094	-0.0058	0.0742	-0.0002	0.0864	0.00
58	SAGBEND	-210.66	-78.00	0.00	-0.001	13.729	321.90	0.0092	-0.0061	0.0749	-0.0002	0.0862	0.00
59	SAGBEND	-222.55	-80.76	0.00	-0.001	12.201	334.10	0.0091	-0.0063	0.0755	0.0001	0.0863	0.00
60	SAGBEND	-234.50	-83.16	0.00	-0.001	10.648	346.30	0.0089	-0.0065	0.0762	-0.0001	0.0871	0.00
61	SAGBEND	-246.53	-85.23	0.00	0.000	9.140	358.50	0.0088	-0.0066	0.0760	0.0001	0.0877	0.00
62	SAGBEND	-258.60	-87.01	0.00	0.001	7.561	370.70	0.0087	-0.0068	0.0736	0.0002	0.0849	0.00
63	SAGBEND	-270.71	-88.46	0.00	0.000	6.083	382.90	0.0086	-0.0069	0.0745	0.0002	0.0852	0.00
64	SAGBEND	-282.86	-89.60	0.00	0.000	4.626	395.10	0.0086	-0.0070	0.0748	-0.0002	0.0855	0.00
65	SAGBEND	-295.03	-90.40	0.00	0.000	3.132	407.30	0.0085	-0.0070	0.0749	-0.0002	0.0855	0.00
66	SAGBEND	-307.22	-90.90	0.00	0.000	1.763	419.50	0.0085	-0.0071	0.0647	-0.0001	0.0750	0.00
67	SAGBEND	-319.41	-91.16	0.00	0.000	0.764	431.70	0.0085	-0.0071	0.0443	0.0002	0.0554	0.00
68	SEABED	-331.61	-91.26	0.00	-0.001	0.202	443.90	0.0085	-0.0071	0.0261	0.0002	0.0373	0.00
69	SEABED	-343.81	-91.28	0.00	0.000	-0.010	456.10	0.0086	-0.0071	0.0083	0.0001	0.0200	0.00
70	SEABED	-356.01	-91.27	0.00	0.000	-0.027	468.30	0.0086	-0.0071	-0.0018	0.0000	0.0147	0.00
71	SEABED	-368.21	-91.27	0.00	0.000	-0.008	480.50	0.0086	-0.0071	-0.0010	0.0000	0.0142	0.00
72	SEABED	-380.41	-91.27	0.00	0.000	-0.001	492.70	0.0086	-0.0071	-0.0004	0.0000	0.0137	0.00
73	SEABED	-392.61	-91.27	0.00	0.000	0.001	504.90	0.0086	-0.0071	0.0001	0.0000	0.0136	0.00

74	SEABED	-404.81	-91.27	0.00	0.000	0.000	517.10	0.0086	-0.0071	0.0001	0.0000	0.0137	0.00
75	SEABED	-417.01	-91.27	0.00	0.000	0.000	529.30	0.0087	-0.0071	0.0000	0.0000	0.0137	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT VERT (KN)	REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	0.00	16.87	0.00	0.00	0.00	0.00	4.66	0.00	4.66
3	LAYBARGE	84.27	5.96	0.00	57.19	0.00	0.00	0.00	-4.64	-82.87	0.00	82.87
5	LAYBARGE	73.45	5.64	0.00	50.48	0.00	0.00	0.00	-8.89	-68.09	0.00	68.09
7	TENSIONR	60.10	5.23	0.00	43.73	0.01	0.00	0.00	376.20	-22.70	0.00	22.70
9	LAYBARGE	57.08	5.14	0.00	0.00	0.00	0.00	0.00	376.07	-20.14	0.00	20.14
10	LAYBARGE	51.08	4.95	0.00	0.00	0.00	0.00	0.00	375.80	-64.52	-0.02	64.52
11	LAYBARGE	46.44	4.79	0.00	38.27	-0.01	0.00	0.00	375.48	-193.34	-0.02	193.34
13	LAYBARGE	44.91	4.73	0.00	0.00	0.00	0.00	0.00	375.38	-212.77	-0.03	212.77
14	TENSIONR	35.35	4.30	0.00	76.51	0.00	0.00	0.00	724.32	-475.10	-0.08	475.10
16	LAYBARGE	23.34	3.42	0.00	119.75	-0.01	0.00	0.00	722.04	-803.36	-0.12	803.36
18	LAYBARGE	8.89	1.61	0.00	149.74	-0.01	0.02	0.00	716.92	-996.66	-0.15	996.66
20	LAYBARGE	3.11	0.61	0.00	250.20	0.02	0.05	0.00	712.16	-1480.25	0.18	1480.25
24	STINGER	-7.61	-1.67	0.00	110.50	-0.01	0.38	0.00	712.85	-803.10	-0.14	803.10
26	STINGER	-16.48	-3.88	0.00	187.06	0.02	1.07	0.00	712.36	-1053.88	0.15	1053.88
29	STINGER	-26.08	-6.57	0.00	133.58	0.02	1.02	0.00	711.36	-542.33	0.09	542.33
32	STINGER	-34.84	-9.19	0.00	197.01	-0.02	0.84	0.00	710.55	-608.40	-0.07	608.40
35	STINGER	-44.34	-12.15	0.00	182.98	-0.04	0.81	0.00	707.79	-847.46	-0.14	847.46
38	STINGER	-53.00	-15.03	0.00	168.20	0.10	0.22	0.00	704.55	-1064.25	0.17	1064.25
41	STINGER	-62.22	-18.47	0.00	148.53	-0.38	0.02	0.00	700.70	-1191.96	-0.78	1191.96
43	STINGER	-72.17	-22.73	0.00	146.56	0.44	0.00	0.00	694.55	-1040.38	2.21	1040.38
45	STINGER	-75.02	-24.05	0.00	0.00	0.00	0.53	0.00	693.77	-812.87	1.88	812.87
47	SAGBEND	-85.94	-29.38	0.00	0.00	0.00	0.00	0.00	688.30	-249.11	0.96	249.11
48	SAGBEND	-96.84	-34.84	0.00	0.00	0.00	0.00	0.00	681.56	194.82	-0.99	194.82
49	SAGBEND	-107.77	-40.24	0.00	0.00	0.00	0.00	0.00	674.77	313.16	-1.17	313.16
50	SAGBEND	-118.78	-45.47	0.00	0.00	0.00	0.00	0.00	668.26	380.14	-1.04	380.14
51	SAGBEND	-129.91	-50.46	0.00	0.00	0.00	0.00	0.00	662.15	414.43	1.02	414.43
52	SAGBEND	-141.15	-55.21	0.00	0.00	0.00	0.00	0.00	656.40	416.82	-0.93	416.82
53	SAGBEND	-152.49	-59.72	0.00	0.00	0.00	0.00	0.00	650.90	421.62	-0.77	421.62
54	SAGBEND	-163.92	-63.97	0.00	0.00	0.00	0.00	0.00	645.68	426.59	0.88	426.59
55	SAGBEND	-175.47	-67.92	0.00	0.00	0.00	0.00	0.00	640.79	436.86	-1.01	436.86
56	SAGBEND	-187.11	-71.58	0.00	0.00	0.00	0.00	0.00	636.30	443.85	-1.31	443.85
57	SAGBEND	-198.85	-74.95	0.00	0.00	0.00	0.00	0.00	632.31	450.69	-1.51	450.69
58	SAGBEND	-210.66	-78.00	0.00	0.00	0.00	0.00	0.00	628.88	454.55	-1.30	454.55
59	SAGBEND	-222.55	-80.76	0.00	0.00	0.00	0.00	0.00	625.97	458.10	0.82	458.10
60	SAGBEND	-234.50	-83.16	0.00	0.00	0.00	0.00	0.00	623.44	462.63	-0.61	462.63
61	SAGBEND	-246.53	-85.23	0.00	0.00	0.00	0.00	0.00	621.21	461.22	0.83	461.22
62	SAGBEND	-258.60	-87.01	0.00	0.00	0.00	0.00	0.00	619.69	447.01	1.14	447.01
63	SAGBEND	-270.71	-88.46	0.00	0.00	0.00	0.00	0.00	618.98	452.13	1.18	452.13
64	SAGBEND	-282.86	-89.60	0.00	0.00	0.00	0.00	0.00	618.68	453.92	-1.32	453.92
65	SAGBEND	-295.03	-90.40	0.00	0.00	0.00	0.00	0.00	618.77	454.82	-1.13	454.82
66	SAGBEND	-307.22	-90.90	0.00	0.24	-0.06	0.00	0.00	619.21	392.48	-0.73	392.48
67	SAGBEND	-319.41	-91.16	0.00	13.91	0.21	0.00	0.00	619.96	269.22	1.03	269.22
68	SEABED	-331.61	-91.26	0.00	25.38	0.22	0.00	0.00	620.93	158.37	1.13	158.37
69	SEABED	-343.81	-91.28	0.00	22.27	-0.05	0.00	0.00	621.89	50.39	0.60	50.39
70	SEABED	-356.01	-91.27	0.00	18.54	-0.03	0.00	0.00	622.78	-11.12	0.15	11.12
71	SEABED	-368.21	-91.27	0.00	16.19	-0.01	0.00	0.00	623.65	-5.91	-0.06	5.91
72	SEABED	-380.41	-91.27	0.00	15.26	0.00	0.00	0.00	624.49	-2.33	0.03	2.33
73	SEABED	-392.61	-91.27	0.00	15.29	0.00	0.00	0.00	625.29	0.77	-0.02	0.77
74	SEABED	-404.81	-91.27	0.00	15.26	0.00	0.00	0.00	626.05	0.35	-0.03	0.35
75	SEABED	-417.01	-91.27	0.00	0.00	0.00	0.00	0.00	626.77	0.00	0.00	0.00

Water Depth 91 m (45°)

OFFPIPE - OFFSHORE PIPELINE ANALYSIS SYSTEM - VERSION 2.05 AC DATE - 3/ 4/2002 TIME - 12:36:52 PAGE 18
PROJECT - 20inch PIPE 40MM CONC. DLB-01 BARGE SE GOM STINGER JOB NO. - JTK FTK ITS
USER ID - FEBRIANTI LICENSED TO: RICKY TAWEKAL CASE 1

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.96	.00	19.62	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	13.79	.00	-7.58	-.01	20.24	4.52
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	13.78	.00	-6.62	.00	19.41	4.33
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	13.74	.00	-21.18	.00	31.74	7.09
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	13.71	.00	-64.62	.00	68.64	15.32
13	LAYBARGE	44.91	4.73	.00	.000	2.150	51.425	13.70	.00	-71.64	.00	74.60	16.65
14	TENSIONR	35.35	4.30	.00	.000	3.172	60.993	27.57	.00	-159.66	-.02	163.29	36.45
16	LAYBARGE	23.34	3.42	.00	.000	5.428	73.039	27.39	.00	-258.94	.00	247.49	55.24
18	LAYBARGE	8.89	1.61	.00	.000	8.945	87.606	27.05	.00	-321.78	.01	300.56	67.09
20	LAYBARGE	3.11	.61	.00	.000	10.749	93.474	26.88	.00	-338.04	-.13	314.21	70.14
24	STINGER	-7.58	-1.70	.00	-.002	13.376	104.412	26.62	-.27	-198.36	-.81	195.36	43.61
26	STINGER	-16.45	-3.94	.00	-.006	14.967	113.556	26.33	-.63	-182.58	-.64	181.84	40.59
29	STINGER	-26.11	-6.65	.00	-.008	16.268	123.589	25.99	-1.07	-105.52	-.53	116.22	25.94
32	STINGER	-34.86	-9.28	.00	-.011	17.150	132.733	25.64	-1.49	-108.32	-.74	118.46	26.44
35	STINGER	-44.31	-12.29	.01	-.009	18.260	142.641	25.23	-1.97	-140.97	.38	146.05	32.60
38	STINGER	-52.95	-15.27	.01	-.022	19.909	151.785	24.79	-2.45	-253.38	-3.74	241.42	53.89
41	STINGER	-62.13	-18.79	.01	.022	22.039	161.614	24.33	-3.02	-221.75	12.02	214.62	47.91
43	STINGER	-72.06	-23.05	.01	-.161	24.484	172.423	23.73	-3.70	-277.98	-46.80	265.21	59.20
45	STINGER	-74.91	-24.37	.02	-.298	25.212	175.562	23.59	-3.91	-211.58	-37.39	208.21	46.47
47	SAGBEND	-85.81	-29.70	.11	-.598	26.574	187.696	22.92	-4.77	-44.49	-12.48	64.72	14.45
48	SAGBEND	-96.71	-35.17	.24	-.671	26.558	199.896	22.19	-5.65	37.53	-.35	57.13	12.75
49	SAGBEND	-107.65	-40.56	.36	-.634	25.860	212.096	21.47	-6.51	78.18	5.31	91.50	20.42
50	SAGBEND	-118.68	-45.79	.48	-.548	24.820	224.296	20.77	-7.35	98.88	7.71	108.93	24.32
51	SAGBEND	-129.80	-50.79	.57	-.443	23.602	236.496	20.10	-8.15	109.89	8.44	118.07	26.35
52	SAGBEND	-141.04	-55.55	.65	-.337	22.287	248.696	19.46	-8.92	116.17	8.35	123.16	27.49
53	SAGBEND	-152.38	-60.04	.71	-.235	20.915	260.896	18.86	-9.64	120.14	7.91	126.29	28.19
54	SAGBEND	-163.83	-64.26	.74	-.140	19.504	273.096	18.30	-10.32	122.94	7.34	128.45	28.67
55	SAGBEND	-175.38	-68.19	.76	-.053	18.064	285.296	17.77	-10.95	125.15	6.75	130.12	29.05
56	SAGBEND	-187.02	-71.82	.77	.026	16.601	297.496	17.29	-11.53	127.01	6.19	131.52	29.36
57	SAGBEND	-198.76	-75.16	.75	.098	15.118	309.696	16.84	-12.07	128.64	5.67	132.74	29.63
58	SAGBEND	-210.57	-78.18	.73	.163	13.617	321.896	16.44	-12.55	130.08	5.20	133.81	29.87
59	SAGBEND	-222.47	-80.90	.69	.222	12.100	334.096	16.07	-12.99	131.30	4.77	134.72	30.07
60	SAGBEND	-234.43	-83.30	.63	.277	10.571	346.296	15.75	-13.37	132.25	4.37	135.41	30.22
61	SAGBEND	-246.45	-85.37	.57	.326	9.033	358.497	15.48	-13.71	132.78	3.96	135.77	30.30
62	SAGBEND	-258.52	-87.13	.50	.369	7.492	370.697	15.24	-13.99	132.66	3.47	135.58	30.26
63	SAGBEND	-270.64	-88.56	.41	.406	5.959	382.897	15.05	-14.22	131.37	2.78	134.41	30.00
64	SAGBEND	-282.79	-89.66	.33	.433	4.452	395.097	14.90	-14.39	127.94	1.66	131.45	29.34
65	SAGBEND	-294.96	-90.45	.23	.442	3.005	407.298	14.80	-14.52	120.48	-.37	125.10	27.92
66	SAGBEND	-307.15	-90.95	.14	.417	1.685	419.498	14.74	-14.60	105.23	-4.26	112.27	25.06
67	SAGBEND	-319.35	-91.19	.06	.329	.621	431.699	14.71	-14.64	74.80	-11.87	87.33	19.49
68	SEABED	-331.55	-91.25	.01	.129	.049	443.899	14.71	-14.65	22.25	-19.01	48.59	10.85
69	SEABED	-343.75	-91.25	.00	.001	-.031	456.100	14.71	-14.65	-1.38	-3.75	28.42	6.34
70	SEABED	-355.95	-91.24	.00	-.008	-.007	468.300	14.71	-14.65	-1.54	.68	26.67	5.95
71	SEABED	-368.15	-91.24	.00	-.001	.001	480.500	14.71	-14.65	-.11	.30	25.66	5.73
72	SEABED	-380.35	-91.24	.00	.000	.001	492.700	14.71	-14.65	.08	.00	25.48	5.69
73	SEABED	-392.55	-91.24	.00	.000	.000	504.900	14.71	-14.65	.02	-.02	25.44	5.68
74	SEABED	-404.75	-91.24	.00	.000	.000	517.100	14.71	-14.65	.00	.00	25.43	5.68
75	SEABED	-416.95	-91.24	.00	.000	.000	529.300	14.71	-14.65	.00	.00	25.43	5.68
76	SEABED	-429.15	-91.24	.00	.000	.000	541.500	14.71	-14.65	.00	.00	25.43	5.68
77	SEABED	-441.35	-91.24	.00	.000	.000	553.700	14.71	-14.65	.00	.00	25.42	5.68
78	SEABED	-453.55	-91.24	.00	.000	.000	565.900	14.71	-14.65	.00	.00	25.42	5.68

OFFPIPE - OFFSHORE PIPELINE ANALYSIS SYSTEM - VERSION 2.05 AC DATE - 3/30/2017 TIME - 11:23:18 PAGE 24
PROJECT - 20inch PIPE 40MM CONC. DLB-01 BARGE SE GOM STINGER JOB NO. - JTK FTK ITS
USER ID - FEBRIANTI LICENSED TO: RICKY TAWEKAL CASE 1

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.32	6.28	0.00	-0.001	1.574	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.28	5.96	0.00	0.000	1.572	12.04	-0.0001	0.0000	-0.0136	-0.0001	0.0137	0.00
5	LAYBARGE	73.46	5.65	0.00	0.000	1.744	22.87	-0.0002	0.0000	-0.0113	0.0000	0.0113	0.00
7	TENSIONR	60.11	5.24	0.00	0.000	1.774	36.22	0.0074	0.0000	-0.0038	0.0000	0.0111	0.00
9	LAYBARGE	57.09	5.15	0.00	0.000	1.807	39.25	0.0074	0.0000	-0.0033	0.0000	0.0106	0.00
10	LAYBARGE	51.10	4.95	0.00	0.000	1.863	45.24	0.0074	0.0000	-0.0107	0.0002	0.0179	0.00
11	LAYBARGE	46.45	4.80	0.00	0.001	2.049	49.89	0.0074	0.0000	-0.0318	0.0002	0.0390	0.00
13	LAYBARGE	44.92	4.74	0.00	0.001	2.151	51.42	0.0074	0.0000	-0.0350	0.0003	0.0422	0.00
14	TENSIONR	35.37	4.31	0.00	0.003	3.174	60.99	0.0142	0.0000	-0.0782	0.0008	0.0920	0.00
16	LAYBARGE	23.35	3.42	0.00	0.003	5.427	73.04	0.0142	0.0000	-0.1319	0.0012	0.1453	0.00
18	LAYBARGE	8.90	1.62	0.00	0.002	8.895	87.61	0.0141	0.0000	-0.1639	0.0015	0.1776	0.00
20	LAYBARGE	3.12	0.61	0.00	-0.004	10.613	93.47	0.0140	0.0000	-0.2904	-0.0030	0.3028	0.00
24	STINGER	-7.61	-1.64	0.00	-0.006	13.432	104.43	0.0139	-0.0002	-0.1431	-0.0025	0.1566	0.00
26	STINGER	-16.46	-3.90	0.00	-0.008	15.326	113.58	0.0138	-0.0003	-0.1903	0.0017	0.2037	0.00
29	STINGER	-26.09	-6.69	0.00	-0.001	16.457	123.60	0.0136	-0.0006	-0.0926	-0.0012	0.1054	0.00
32	STINGER	-34.82	-9.35	0.00	-0.002	17.376	132.75	0.0135	-0.0008	-0.1022	-0.0012	0.1148	0.00

35	STINGER	-44.26	-12.33	0.01	-0.003	18.195	142.65	0.0133	-0.0010	-0.1513	0.0017	0.1643	0.00
38	STINGER	-52.92	-15.30	0.01	-0.025	19.712	151.79	0.0131	-0.0012	-0.1706	-0.0041	0.1836	0.00
41	STINGER	-62.11	-18.81	0.02	0.028	21.859	161.62	0.0129	-0.0015	-0.2008	0.0159	0.2127	0.00
43	STINGER	-72.05	-23.04	0.02	-0.183	24.551	172.43	0.0126	-0.0018	-0.1735	-0.0553	0.1877	0.00
45	STINGER	-74.90	-24.36	0.04	-0.337	25.252	175.57	0.0125	-0.0019	-0.1362	-0.0452	0.1502	0.00
47	SAGBEND	-85.81	-29.70	0.13	-0.705	26.611	187.70	0.0122	-0.0023	-0.0394	-0.0181	0.0528	0.00
48	SAGBEND	-96.71	-35.19	0.27	-0.802	26.581	199.90	0.0119	-0.0028	0.0349	-0.0117	0.0485	0.00
49	SAGBEND	-107.66	-40.60	0.41	-0.741	25.869	212.10	0.0115	-0.0032	0.0545	0.0122	0.0665	0.00
50	SAGBEND	-118.68	-45.83	0.55	-0.593	24.823	224.30	0.0112	-0.0036	0.0641	0.0148	0.0765	0.00
51	SAGBEND	-129.80	-50.82	0.67	-0.506	23.626	236.50	0.0109	-0.0040	0.0699	0.0155	0.0825	0.00
52	SAGBEND	-141.04	-55.56	0.75	-0.423	22.286	248.70	0.0106	-0.0043	0.0706	0.0156	0.0826	0.00
53	SAGBEND	-152.38	-60.03	0.80	-0.272	20.837	260.90	0.0103	-0.0047	0.0711	0.0131	0.0834	0.00
54	SAGBEND	-163.82	-64.28	0.84	-0.154	19.446	273.10	0.0101	-0.0050	0.0716	0.0118	0.0833	0.00
55	SAGBEND	-175.37	-68.22	0.87	-0.082	18.074	285.30	0.0098	-0.0053	0.0735	0.0120	0.0849	0.00
56	SAGBEND	-187.02	-71.87	0.88	-0.063	16.602	297.50	0.0096	-0.0056	0.0759	0.0120	0.0871	0.00
57	SAGBEND	-198.75	-75.22	0.86	0.036	15.092	309.70	0.0094	-0.0059	0.0758	0.0134	0.0876	0.00
58	SAGBEND	-210.56	-78.22	0.84	0.197	13.618	321.90	0.0092	-0.0061	0.0762	0.0157	0.0879	0.00
59	SAGBEND	-222.47	-80.89	0.81	0.211	12.071	334.10	0.0090	-0.0063	0.0762	0.0137	0.0882	0.00
60	SAGBEND	-234.43	-83.26	0.75	0.271	10.496	346.30	0.0089	-0.0065	0.0781	0.0121	0.0897	0.00
61	SAGBEND	-246.46	-85.29	0.65	0.400	9.030	358.50	0.0088	-0.0066	0.0783	0.0096	0.0895	0.00
62	SAGBEND	-258.53	-87.05	0.60	0.479	7.482	370.70	0.0087	-0.0068	0.0740	0.0098	0.0852	0.00
63	SAGBEND	-270.64	-88.50	0.51	0.490	6.097	382.90	0.0086	-0.0069	0.0758	0.0097	0.0865	0.00
64	SAGBEND	-282.79	-89.63	0.40	0.473	4.586	395.10	0.0085	-0.0070	0.0762	-0.0101	0.0866	0.00
65	SAGBEND	-294.96	-90.43	0.30	0.506	3.080	407.30	0.0085	-0.0070	0.0778	-0.0109	0.0889	0.00
66	SAGBEND	-307.15	-90.92	0.21	0.474	1.713	419.50	0.0085	-0.0071	0.0640	-0.0124	0.0748	0.00
67	SAGBEND	-319.34	-91.16	0.13	0.383	0.726	431.70	0.0085	-0.0071	0.0441	-0.0157	0.0551	0.00
68	SEABED	-331.54	-91.26	0.06	0.276	0.194	443.90	0.0085	-0.0071	0.0257	-0.0158	0.0384	0.00
69	SEABED	-343.74	-91.28	0.01	0.125	-0.010	456.10	0.0085	-0.0071	0.0083	-0.0129	0.0254	0.00
70	SEABED	-355.94	-91.27	0.00	0.013	-0.026	468.30	0.0085	-0.0071	-0.0018	-0.0057	0.0178	0.00
71	SEABED	-368.14	-91.27	0.00	-0.007	-0.008	480.50	0.0085	-0.0071	-0.0009	-0.0008	0.0141	0.00
72	SEABED	-380.34	-91.27	0.00	-0.004	0.000	492.70	0.0085	-0.0071	-0.0004	0.0005	0.0137	0.00
73	SEABED	-392.54	-91.27	0.00	-0.001	0.001	504.90	0.0086	-0.0071	0.0001	0.0002	0.0136	0.00
74	SEABED	-404.74	-91.27	0.00	0.000	0.000	517.10	0.0086	-0.0071	0.0001	-0.0001	0.0136	0.00
75	SEABED	-416.94	-91.27	0.00	0.000	0.000	529.30	0.0086	-0.0071	0.0000	0.0000	0.0136	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	HORIZ (KN)	SUPT SEPARATIONS VERT (M)	HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	HORIZ (KN-M)	TOTAL (KN-M)
1	LAYBARGE	96.32	6.28	0.00	16.93	-0.24	0.00	0.00	0.00	4.68	0.07	4.68
3	LAYBARGE	84.28	5.96	0.00	57.29	-0.50	0.00	0.00	-4.82	-82.74	-0.44	82.75
5	LAYBARGE	73.46	5.65	0.00	50.98	0.30	0.00	0.00	-9.24	-68.45	-0.28	68.45
7	TENSIONR	60.11	5.24	0.00	44.38	0.53	0.00	0.00	378.23	-22.83	-0.17	22.83
9	LAYBARGE	57.09	5.15	0.00	0.00	0.00	0.00	0.00	378.38	-20.12	0.20	20.12
10	LAYBARGE	51.10	4.95	0.00	0.00	0.00	0.00	0.00	378.65	-64.70	1.01	64.70
11	LAYBARGE	46.45	4.80	0.00	38.14	0.35	0.00	0.00	378.76	-192.91	1.40	192.91
13	LAYBARGE	44.92	4.74	0.00	0.00	0.00	0.00	0.00	378.80	-212.62	1.86	212.62
14	TENSIONR	35.37	4.31	0.00	75.78	0.35	0.00	0.00	724.49	-474.56	4.78	474.56
16	LAYBARGE	23.35	3.42	0.00	119.30	0.88	0.00	0.00	721.54	-800.74	7.17	800.75
18	LAYBARGE	8.90	1.62	0.00	146.71	-2.29	0.02	0.00	714.94	-994.77	9.19	994.77
20	LAYBARGE	3.12	0.61	0.00	252.56	-4.50	0.05	0.00	711.15	-1502.04	-18.12	1502.04
24	STINGER	-7.61	-1.64	0.00	118.73	-7.28	0.37	0.00	711.01	-868.39	-14.88	868.40
26	STINGER	-16.46	-3.90	0.00	198.15	-4.75	1.02	0.00	709.10	-1153.82	10.33	1153.83
29	STINGER	-26.09	-6.69	0.00	118.68	-4.61	0.98	0.00	705.99	-562.25	-7.30	562.25
32	STINGER	-34.82	-9.35	0.00	200.01	-4.38	0.90	0.00	704.21	-620.12	-7.09	620.12
35	STINGER	-44.26	-12.33	0.01	218.46	4.37	0.86	0.00	700.85	-918.48	10.16	918.49
38	STINGER	-52.92	-15.30	0.01	170.53	-15.31	0.24	0.00	698.20	-1035.18	-25.00	1035.27
41	STINGER	-62.11	-18.81	0.02	147.10	52.66	0.03	0.00	693.85	-1215.03	96.38	1215.37
43	STINGER	-72.05	-23.04	0.02	149.82	-68.03	0.00	0.00	687.40	-1052.66	-335.73	1058.58
45	STINGER	-74.90	-24.36	0.04	0.00	0.00	0.53	0.03	686.70	-826.95	-274.64	831.69
47	SAGBEND	-85.81	-29.70	0.13	0.00	0.00	0.00	0.00	681.63	-239.36	-109.93	240.59
48	SAGBEND	-96.71	-35.19	0.27	0.00	0.00	0.00	0.00	675.75	212.02	-70.80	217.43
49	SAGBEND	-107.66	-40.60	0.41	0.00	0.00	0.00	0.00	669.76	330.88	73.79	330.97
50	SAGBEND	-118.68	-45.83	0.55	0.00	0.00	0.00	0.00	663.89	389.17	89.67	390.15
51	SAGBEND	-129.80	-50.82	0.67	0.00	0.00	0.00	0.00	658.24	424.45	93.88	424.50
52	SAGBEND	-141.04	-55.56	0.75	0.00	0.00	0.00	0.00	652.83	428.46	94.41	428.48
53	SAGBEND	-152.38	-60.03	0.80	0.00	0.00	0.00	0.00	647.68	431.38	79.35	433.79
54	SAGBEND	-163.82	-64.28	0.84	0.00	0.00	0.00	0.00	642.83	434.41	71.58	434.89
55	SAGBEND	-175.37	-68.22	0.87	0.00	0.00	0.00	0.00	638.32	446.01	72.72	446.01
56	SAGBEND	-187.02	-71.87	0.88	0.00	0.00	0.00	0.00	634.20	460.81	72.86	461.00
57	SAGBEND	-198.75	-75.22	0.86	0.00	0.00	0.00	0.00	630.51	459.98	81.55	460.12
58	SAGBEND	-210.56	-78.22	0.84	0.00	0.00	0.00	0.00	627.29	462.29	95.22	462.48
59	SAGBEND	-222.47	-80.89	0.81	0.00	0.00	0.00	0.00	624.52	462.63	83.23	462.70
60	SAGBEND	-234.43	-83.26	0.75	0.00	0.00	0.00	0.00	622.14	473.85	73.17	474.03
61	SAGBEND	-246.46	-85.29	0.65	0.00	0.00	0.00	0.00	620.11	475.21	58.04	475.46
62	SAGBEND	-258.53	-87.05	0.60	0.00	0.00	0.00	0.00	618.41	449.25	59.79	449.46
63	SAGBEND	-270.64	-88.50	0.51	0.00	0.00	0.00	0.00	617.08	460.33	58.87	460.81
64	SAGBEND	-282.79	-89.63	0.40	0.00	0.00	0.00	0.00	616.16	462.25	-61.03	464.16
65	SAGBEND	-294.96	-90.43	0.30	0.00	0.00	0.00	0.00	615.67	472.19	-66.35	472.20
66	SAGBEND	-307.15	-90.92	0.21	0.46	-0.46	0.00	0.00	615.62	388.54	-75.05	389.75
67	SAGBEND	-319.34	-91.16	0.13	14.97	-8.31	0.00	0.00	615.94	267.65	-95.50	268.60
68	SEABED	-331.54	-91.26	0.06	26.31	-13.35	0.00	0.00	616.47	156.18	-95.92	162.35
69	SEABED	-343.74	-91.28	0.01	22.06	-10.71	0.00	0.00	617.03	50.11	-78.34	85.19
70	SEABED	-355.94	-91.27	0.00	18.66	3.28	0.00	0.00	618.36	-10.87	-34.51	34.91
71	SEABED	-368.14	-91.27	0.00	16.19	1.78	0.00	0.00	619.64	-5.66	-4.88	6.87
72	SEABED	-380.34	-91.27	0.00	15.29	0.71	0.00	0.00	620.87	-2.32	2.96	3.02
73	SEABED	-392.54	-91.27	0.00	15.28	-0.20	0.00	0.00	622.05	0.84	1.32	1.32
74	SEABED	-404.74	-91.27	0.00	15.26	-0.16	0.00	0.00	623.17	0.40	-0.56	0.58
75	SEABED	-416.94	-91.27	0.00	0.00	-0.03	0.00	0.00	624.24	0.00	0.00	0.00

Water Depth 91 m (90°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.96	.00	19.62	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	13.79	.00	-7.58	-.02	20.24	4.52
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	13.78	.00	-6.62	.00	19.41	4.33
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	13.74	.00	-21.18	.00	31.74	7.09
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	13.71	.00	-64.62	.00	68.65	15.32
13	LAYBARGE	44.91	4.73	.00	.000	2.150	51.425	13.70	.00	-71.64	.00	74.60	16.65
14	TENSIONR	35.35	4.30	.00	.000	3.172	60.993	27.57	.00	-159.66	-.04	163.28	36.45
16	LAYBARGE	23.34	3.42	.00	.000	5.429	73.039	27.39	.00	-258.96	.00	247.50	55.25
18	LAYBARGE	8.89	1.61	.00	.000	8.945	87.606	27.05	.00	-321.71	.01	300.50	67.08
20	LAYBARGE	3.11	.61	.00	-.001	10.750	93.474	26.88	.00	-338.50	-.26	314.60	70.22
24	STINGER	-7.60	-1.71	.00	-.004	13.422	104.432	26.62	-.27	-205.91	-1.54	201.78	45.04
26	STINGER	-16.47	-3.95	.00	-.011	14.940	113.576	26.34	-.63	-157.66	-1.21	160.67	35.86
29	STINGER	-26.12	-6.64	.00	-.015	16.083	123.593	25.99	-1.07	-96.60	-1.01	108.65	24.25
32	STINGER	-34.88	-9.24	.01	-.021	16.935	132.737	25.64	-1.48	-109.78	-1.39	119.71	26.72
35	STINGER	-44.33	-12.21	.01	-.018	18.101	142.642	25.23	-1.96	-151.87	.71	155.32	34.67
38	STINGER	-52.98	-15.18	.01	-.041	19.891	151.786	24.79	-2.44	-275.33	-7.02	260.12	58.06
41	STINGER	-62.15	-18.72	.02	.041	22.286	161.620	24.32	-3.00	-257.66	22.53	245.69	54.84
43	STINGER	-72.06	-23.03	.02	-.302	24.728	172.429	23.75	-3.70	-241.02	-87.63	243.61	54.38
45	STINGER	-74.90	-24.35	.04	-.559	25.355	175.557	23.60	-3.91	-181.69	-70.11	191.12	42.66
47	SAGBEND	-85.80	-29.69	.21	-1.124	26.488	187.696	22.92	-4.77	-32.39	-23.79	59.61	13.31
48	SAGBEND	-96.71	-35.13	.45	-1.269	26.388	199.896	22.20	-5.64	40.98	-1.26	60.06	13.41
49	SAGBEND	-107.67	-40.49	.68	-1.208	25.676	212.096	21.48	-6.50	77.59	9.32	91.33	20.39
50	SAGBEND	-118.71	-45.68	.90	-1.053	24.655	224.296	20.78	-7.33	96.55	13.93	107.55	24.01
51	SAGBEND	-129.85	-50.66	1.09	-.863	23.468	236.496	20.11	-8.13	106.97	15.45	116.26	25.95
52	SAGBEND	-141.09	-55.39	1.24	-.667	22.188	248.696	19.48	-8.89	113.21	15.46	121.29	27.07
53	SAGBEND	-152.44	-59.87	1.35	-.477	20.849	260.896	18.88	-9.61	117.37	14.80	124.53	27.80
54	SAGBEND	-163.89	-64.08	1.43	-.299	19.469	273.096	18.32	-10.29	120.47	13.88	126.86	28.32
55	SAGBEND	-175.44	-68.00	1.47	-.134	18.056	285.296	17.80	-10.92	122.99	12.89	128.72	28.73
56	SAGBEND	-187.09	-71.64	1.48	.017	16.616	297.496	17.31	-11.50	125.15	11.92	130.30	29.09
57	SAGBEND	-198.82	-74.97	1.47	.156	15.153	309.696	16.86	-12.04	127.06	11.02	131.70	29.40
58	SAGBEND	-210.64	-78.01	1.42	.283	13.669	321.896	16.46	-12.52	128.75	10.20	132.94	29.67
59	SAGBEND	-222.53	-80.74	1.35	.401	12.166	334.096	16.09	-12.96	130.19	9.44	134.00	29.91
60	SAGBEND	-234.49	-83.15	1.26	.508	10.649	346.296	15.77	-13.35	131.35	8.72	134.83	30.10
61	SAGBEND	-246.50	-85.25	1.14	.607	9.120	358.496	15.49	-13.69	132.08	7.98	135.33	30.21
62	SAGBEND	-258.57	-87.02	1.00	.696	7.586	370.697	15.26	-13.97	132.16	7.12	135.28	30.20
63	SAGBEND	-270.69	-88.47	.85	.773	6.057	382.897	15.06	-14.20	131.10	5.93	134.28	29.97
64	SAGBEND	-282.83	-89.59	.67	.831	4.552	395.097	14.91	-14.38	127.98	3.99	131.54	29.36
65	SAGBEND	-295.00	-90.41	.49	.860	3.102	407.298	14.81	-14.51	121.00	.50	125.54	28.02
66	SAGBEND	-307.19	-90.92	.31	.831	1.772	419.498	14.74	-14.60	106.57	-6.15	113.48	25.33
67	SAGBEND	-319.39	-91.18	.15	.693	.684	431.699	14.71	-14.64	77.68	-19.14	90.92	20.29
68	SEABED	-331.59	-91.25	.03	.355	.069	443.899	14.71	-14.65	25.68	-37.04	61.66	13.76
69	SEABED	-343.79	-91.25	.00	.035	-.032	456.100	14.71	-14.65	-.89	-13.38	35.76	7.98
70	SEABED	-355.99	-91.24	.00	-.017	-.008	468.300	14.71	-14.65	-1.68	.57	26.75	5.97
71	SEABED	-368.19	-91.24	.00	-.004	.001	480.500	14.71	-14.65	-.16	.86	26.07	5.82
72	SEABED	-380.39	-91.24	.00	.001	.001	492.700	14.71	-14.65	.08	.07	25.50	5.69
73	SEABED	-392.59	-91.24	.00	.000	.000	504.900	14.71	-14.65	.02	-.04	25.46	5.68
74	SEABED	-404.79	-91.24	.00	.000	.000	517.100	14.71	-14.65	.00	-.01	25.43	5.68
75	SEABED	-416.99	-91.24	.00	.000	.000	529.300	14.71	-14.65	.00	.00	25.43	5.68
76	SEABED	-429.19	-91.24	.00	.000	.000	541.500	14.71	-14.65	.00	.00	25.43	5.68
77	SEABED	-441.39	-91.24	.00	.000	.000	553.700	14.71	-14.65	.00	.00	25.42	5.68
78	SEABED	-453.59	-91.24	.00	.000	.000	565.900	14.71	-14.65	.00	.00	25.42	5.68

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.46	.00	.00	.00	-1.36	-77.23	.00	77.23
5	LAYBARGE	73.45	5.65	.00	50.07	.00	.00	.00	-2.64	-67.33	.00	67.33
7	TENSIONR	60.11	5.23	.00	43.24	.09	.00	.00	339.03	-22.24	-.07	22.24
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	338.65	-19.42	.00	19.42
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	337.85	-62.10	.00	62.10
11	LAYBARGE	46.45	4.79	.00	36.32	.00	.00	.00	337.11	-189.51	.00	189.51
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	336.87	-210.09	.00	210.09
14	TENSIONR	35.35	4.30	.00	70.33	.15	.00	.00	677.81	-468.20	-.11	468.20
16	LAYBARGE	23.34	3.42	.00	99.72	.00	.00	.00	673.19	-759.40	-.01	759.40
18	LAYBARGE	8.89	1.61	.00	75.45	.14	.00	.00	665.01	-943.40	.04	943.40
20	LAYBARGE	3.11	.61	.00	93.92	-.80	.00	.00	660.62	-992.64	-.77	992.64
24	STINGER	-7.60	-1.71	.00	19.12	-2.62	.00	.00	657.77	-603.83	-4.53	603.85
26	STINGER	-16.47	-3.95	.00	29.34	-2.32	.00	.00	655.41	-462.32	-3.55	462.34
29	STINGER	-26.12	-6.64	.00	.00	-2.16	.01	.00	652.44	-283.29	-2.96	283.30
32	STINGER	-34.88	-9.24	.01	14.29	-3.03	.00	.00	649.15	-321.93	-4.07	321.96
35	STINGER	-44.33	-12.21	.01	.00	.87	.03	.00	645.18	-445.37	2.07	445.38

38	STINGER	-52.98	-15.18	.01	80.65	-13.59	.00	.00	640.20	-807.40	-20.60	807.66
41	STINGER	-62.15	-18.72	.02	37.79	36.33	.00	.00	636.02	-755.59	66.06	758.47
43	STINGER	-72.06	-23.03	.02	76.11	-52.64	.00	.00	630.68	-706.79	-256.98	752.06
45	STINGER	-74.90	-24.35	.04	.00	.00	.52	.02	629.72	-532.80	-205.59	571.09
47	SAGBEND	-85.80	-29.69	.21	.00	.00	.00	.00	623.96	-94.98	-69.76	117.85
48	SAGBEND	-96.71	-35.13	.45	.00	.00	.00	.00	617.19	120.16	-3.71	120.22
49	SAGBEND	-107.67	-40.49	.68	.00	.00	.00	.00	610.41	227.53	27.34	229.17
50	SAGBEND	-118.71	-45.68	.90	.00	.00	.00	.00	603.87	283.14	40.85	286.07
51	SAGBEND	-129.85	-50.66	1.09	.00	.00	.00	.00	597.63	313.69	45.32	316.94
52	SAGBEND	-141.09	-55.39	1.24	.00	.00	.00	.00	591.71	331.99	45.34	335.07
53	SAGBEND	-152.44	-59.87	1.35	.00	.00	.00	.00	586.12	344.20	43.40	346.93
54	SAGBEND	-163.89	-64.08	1.43	.00	.00	.00	.00	580.87	353.29	40.69	355.62
55	SAGBEND	-175.44	-68.00	1.47	.00	.00	.00	.00	575.98	360.67	37.79	362.64
56	SAGBEND	-187.09	-71.64	1.48	.00	.00	.00	.00	571.44	367.01	34.97	368.67
57	SAGBEND	-198.82	-74.97	1.47	.00	.00	.00	.00	567.28	372.61	32.32	374.00
58	SAGBEND	-210.64	-78.01	1.42	.00	.00	.00	.00	563.49	377.55	29.90	378.73
59	SAGBEND	-222.53	-80.74	1.35	.00	.00	.00	.00	560.09	381.79	27.67	382.79
60	SAGBEND	-234.49	-83.15	1.26	.00	.00	.00	.00	557.08	385.17	25.56	386.02
61	SAGBEND	-246.50	-85.25	1.14	.00	.00	.00	.00	554.47	387.33	23.40	388.04
62	SAGBEND	-258.57	-87.02	1.00	.00	.00	.00	.00	552.26	387.55	20.88	388.11
63	SAGBEND	-270.69	-88.47	.85	.00	.00	.00	.00	550.47	384.45	17.38	384.84
64	SAGBEND	-282.83	-89.59	.67	.00	.00	.00	.00	549.09	375.31	11.70	375.49
65	SAGBEND	-295.00	-90.41	.49	.00	.00	.00	.00	548.12	354.83	1.47	354.83
66	SAGBEND	-307.19	-90.92	.31	.00	.00	.00	.00	547.56	312.53	-18.03	313.05
67	SAGBEND	-319.39	-91.18	.15	.78	-.89	.00	.00	547.36	227.79	-56.12	234.60
68	SEABED	-331.59	-91.25	.03	18.66	-14.81	.00	.00	547.41	75.29	-108.61	132.16
69	SEABED	-343.79	-91.25	.00	21.27	1.43	.00	.00	547.43	-2.60	-39.24	39.33
70	SEABED	-355.99	-91.24	.00	15.82	3.24	.00	.00	547.43	-4.94	1.68	5.22
71	SEABED	-368.19	-91.24	.00	14.89	.30	.00	.00	547.43	-.47	2.52	2.57
72	SEABED	-380.39	-91.24	.00	15.10	-.16	.00	.00	547.43	.24	.20	.31
73	SEABED	-392.59	-91.24	.00	15.18	-.04	.00	.00	547.43	.06	-.13	.14
74	SEABED	-404.79	-91.24	.00	15.18	.01	.00	.00	547.43	-.01	-.03	.03
75	SEABED	-416.99	-91.24	.00	15.18	.00	.00	.00	547.43	.00	.00	.01
76	SEABED	-429.19	-91.24	.00	15.17	.00	.00	.00	547.43	.00	.00	.00
77	SEABED	-441.39	-91.24	.00	15.18	.00	.00	.00	547.43	.00	.00	.00
78	SEABED	-453.59	-91.24	.00	.00	.00	.00	.00	547.43	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.32	6.28	0.00	-0.001	1.574	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.29	5.95	0.00	-0.001	1.571	12.04	-0.0001	0.0000	-0.0137	-0.0003	0.0138	0.00
5	LAYBARGE	73.46	5.64	0.00	-0.001	1.744	22.87	-0.0002	0.0000	-0.0113	-0.0002	0.0114	0.00
7	TENSIONR	60.11	5.23	0.00	-0.002	1.773	36.22	0.0074	0.0000	-0.0038	-0.0002	0.0111	0.00
9	LAYBARGE	57.09	5.13	0.00	-0.001	1.806	39.25	0.0074	0.0000	-0.0033	0.0001	0.0106	0.00
10	LAYBARGE	51.10	4.94	0.00	-0.002	1.862	45.24	0.0074	0.0000	-0.0108	0.0005	0.0178	0.00
11	LAYBARGE	46.46	4.79	0.00	-0.002	2.048	49.89	0.0074	0.0000	-0.0323	-0.0004	0.0391	0.00
13	LAYBARGE	44.92	4.73	0.00	-0.002	2.149	51.42	0.0074	0.0000	-0.0351	-0.0006	0.0422	0.00
14	TENSIONR	35.37	4.30	0.00	-0.002	3.169	60.99	0.0142	0.0000	-0.0780	0.0016	0.0918	0.00
16	LAYBARGE	23.36	3.42	0.00	-0.003	5.423	73.04	0.0142	0.0000	-0.1398	0.0023	0.1532	0.00
18	LAYBARGE	8.90	1.61	0.00	-0.001	8.754	87.61	0.0141	0.0000	-0.1645	0.0037	0.1782	0.00
20	LAYBARGE	3.12	0.61	0.00	0.003	10.322	93.47	0.0140	0.0000	-0.2813	0.0059	0.2941	0.00
24	STINGER	-7.62	-1.67	0.00	0.007	13.086	104.44	0.0139	-0.0002	-0.1381	-0.0064	0.1505	0.00
26	STINGER	-16.50	-3.87	0.01	0.000	14.839	113.58	0.0138	-0.0003	-0.1886	0.0033	0.2017	0.00
29	STINGER	-26.10	-6.54	0.02	-0.008	15.996	123.60	0.0137	-0.0005	-0.1218	-0.0029	0.1340	0.00
32	STINGER	-34.87	-9.18	0.02	-0.024	17.120	132.74	0.0135	-0.0007	-0.1432	-0.0037	0.1564	0.00
35	STINGER	-44.34	-12.18	0.01	-0.035	18.346	142.64	0.0133	-0.0010	-0.1861	-0.0038	0.1994	0.00
38	STINGER	-52.98	-15.19	0.02	-0.068	20.009	151.79	0.0131	-0.0012	-0.1900	-0.0070	0.2032	0.00
41	STINGER	-62.15	-18.75	0.03	0.029	22.356	161.62	0.0128	-0.0015	-0.1726	0.0241	0.1866	0.00
43	STINGER	-72.08	-23.04	0.04	-0.355	24.913	172.43	0.0126	-0.0018	-0.1586	-0.0832	0.1849	0.00
45	STINGER	-74.91	-24.37	0.06	-0.623	25.495	175.56	0.0125	-0.0019	-0.1236	-0.0676	0.1471	0.00
47	SAGBEND	-85.75	-29.70	0.24	-1.177	26.678	187.70	0.0122	-0.0023	-0.0367	-0.0280	0.0535	0.00
48	SAGBEND	-96.66	-35.16	0.49	-1.344	26.547	199.90	0.0118	-0.0028	0.0393	-0.0164	0.0521	0.00
49	SAGBEND	-107.62	-40.54	0.74	-1.256	25.775	212.10	0.0115	-0.0032	0.0572	0.0178	0.0699	0.00
50	SAGBEND	-118.65	-45.75	0.98	-1.105	24.683	224.30	0.0112	-0.0036	0.0670	0.0196	0.0793	0.00
51	SAGBEND	-129.80	-50.70	1.19	-0.920	23.492	236.50	0.0109	-0.0040	0.0707	0.0210	0.0831	0.00
52	SAGBEND	-141.06	-55.41	1.35	-0.701	22.159	248.70	0.0106	-0.0043	0.0710	0.0198	0.0833	0.00
53	SAGBEND	-152.43	-59.83	1.45	-0.476	20.786	260.90	0.0103	-0.0047	0.0706	0.0188	0.0824	0.00
54	SAGBEND	-163.88	-64.01	1.54	-0.250	19.404	273.10	0.0100	-0.0050	0.0740	0.0181	0.0858	0.00
55	SAGBEND	-175.43	-67.91	1.60	-0.125	17.982	285.30	0.0098	-0.0053	0.0756	0.0166	0.0877	0.00
56	SAGBEND	-187.08	-71.54	1.61	-0.022	16.564	297.50	0.0096	-0.0056	0.0758	0.0142	0.0877	0.00
57	SAGBEND	-198.82	-74.88	1.59	0.159	15.049	309.70	0.0094	-0.0058	0.0756	0.0131	0.0870	0.00
58	SAGBEND	-210.64	-77.94	1.57	0.337	13.550	321.90	0.0092	-0.0061	0.0750	0.0139	0.0864	0.00
59	SAGBEND	-222.53	-80.66	1.51	0.400	12.147	334.10	0.0090	-0.0063	0.0735	0.0139	0.0835	0.00
60	SAGBEND	-234.49	-83.06	1.39	0.474	10.615	346.30	0.0089	-0.0065	0.0729	0.0136	0.0837	0.00
61	SAGBEND	-246.50	-85.16	1.24	0.589	9.129	358.50	0.0088	-0.0066	0.0756	0.0142	0.0867	0.00
62	SAGBEND	-258.57	-86.95	1.12	0.733	7.653	370.70	0.0087	-0.0068	0.0757	0.0137	0.0866	0.00
63	SAGBEND	-270.69	-88.43	0.99	0.842	6.098	382.90	0.0086	-0.0069	0.0762	0.0123	0.0880	0.00
64	SAGBEND	-282.83	-89.59	0.82	0.893	4.621	395.10	0.0085	-0.0070	0.0778	0.0118	0.0895	0.00
65	SAGBEND	-295.00	-90.41	0.61	0.947	3.156	407.30	0.0085	-0.0070	0.0723	-0.0088	0.0841	0.00
66	SAGBEND	-307.19	-90.92	0.41	0.978	1.748	419.50	0.0085	-0.0071	0.0583	-0.0143	0.0692	0.00
67	SAGBEND	-319.38	-91.17	0.23	0.805	0.720	431.70	0.0085	-0.0071	0.0463	-0.0215	0.0570	0.00
68	SEABED	-331.58	-91.26	0.09	0.483	0.180	443.90	0.0085	-0.0071	0.0258	-0.0222	0.0394	0.00
69	SEABED	-343.78	-91.28	0.02	0.205	-0.009	456.10	0.0085	-0.0071	0.0075	-0.0187	0.0304	0.00
70	SEABED	-355.98	-91.27	0.00	0.038	-0.027	468.30	0.0085	-0.0071	-0.0016	-0.0089	0.0207	0.00
71	SEABED	-368.18	-91.27	0.00	-0.014	-0.008	480.50	0.0085	-0.0071	-0.0010	-0.0016	0.0144	0.00
72	SEABED	-380.38	-91.27	0.00	-0.007	-0.001	492.70	0.0086	-0.0071	-0.0003	0.0006	0.0139	0.00
73	SEABED	-392.58	-91.27	0.00	-0.002	0.001	504.90	0.0086	-0.0071	0.0001	0.0003	0.0137	0.00

74	SEABED	-404.78	-91.27	0.00	0.001	0.000	517.10	0.0086	-0.0071	0.0001	0.0001	0.0136	0.00
75	SEABED	-416.98	-91.27	0.00	0.000	0.000	529.30	0.0086	-0.0071	0.0000	0.0000	0.0136	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT VERT (KN)	REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.32	6.28	0.00	17.11	1.01	0.00	0.00	0.00	4.73	-0.28	4.73
3	LAYBARGE	84.29	5.95	0.00	57.89	2.50	0.00	0.00	-4.05	-83.35	-1.71	83.35
5	LAYBARGE	73.46	5.64	0.00	51.40	2.18	0.00	0.00	-7.76	-68.64	-1.33	68.64
7	TENSIONR	60.11	5.23	0.00	45.00	2.99	0.00	0.00	376.35	-23.17	-1.22	23.17
9	LAYBARGE	57.09	5.13	0.00	0.00	0.00	0.00	0.00	376.27	-20.09	0.42	20.09
10	LAYBARGE	51.10	4.94	0.00	0.00	0.00	0.00	0.00	376.07	-65.77	2.76	65.77
11	LAYBARGE	46.46	4.79	0.00	40.64	2.44	0.00	0.00	375.79	-196.18	-2.68	196.18
13	LAYBARGE	44.92	4.73	0.00	0.00	0.00	0.00	0.00	375.70	-213.09	-3.45	213.09
14	TENSIONR	35.37	4.30	0.00	74.20	1.69	0.00	0.00	723.66	-473.32	9.86	473.35
16	LAYBARGE	23.36	3.42	0.00	143.10	2.90	0.00	0.00	721.40	-848.64	13.69	848.64
18	LAYBARGE	8.90	1.61	0.00	150.53	-15.11	0.01	0.00	716.10	-998.22	22.62	998.47
20	LAYBARGE	3.12	0.61	0.00	234.89	-11.69	0.09	0.00	713.85	-1488.79	35.74	1488.88
24	STINGER	-7.62	-1.67	0.00	95.79	-28.61	0.45	0.00	712.68	-838.49	-38.57	838.53
26	STINGER	-16.50	-3.87	0.01	201.31	-9.48	1.26	0.00	710.63	-1143.90	20.19	1143.90
29	STINGER	-26.10	-6.54	0.02	109.84	-8.83	1.21	0.00	709.36	-739.26	-17.54	739.29
32	STINGER	-34.87	-9.18	0.02	166.19	-7.19	0.44	0.00	705.66	-869.55	-22.69	869.69
35	STINGER	-44.34	-12.18	0.01	160.37	5.84	0.42	0.00	701.58	-1128.59	-23.25	1128.71
38	STINGER	-52.98	-15.19	0.02	132.45	-24.40	0.10	0.00	697.66	-1152.26	-42.51	1152.66
41	STINGER	-62.15	-18.75	0.03	134.52	77.38	0.01	0.00	691.31	-1047.59	146.22	1052.96
43	STINGER	-72.08	-23.04	0.04	123.70	-101.68	0.00	0.00	686.10	-962.79	-504.97	1043.56
45	STINGER	-74.91	-24.37	0.06	0.00	0.00	0.55	0.04	685.17	-750.36	-410.63	814.78
47	SAGBEND	-85.75	-29.70	0.24	0.00	0.00	0.00	0.00	679.48	-222.49	-169.96	251.86
48	SAGBEND	-96.66	-35.16	0.49	0.00	0.00	0.00	0.00	673.06	238.86	-99.40	239.26
49	SAGBEND	-107.62	-40.54	0.74	0.00	0.00	0.00	0.00	667.12	346.92	108.19	348.69
50	SAGBEND	-118.65	-45.75	0.98	0.00	0.00	0.00	0.00	661.36	406.59	118.91	406.74
51	SAGBEND	-129.80	-50.70	1.19	0.00	0.00	0.00	0.00	655.81	428.97	127.44	429.26
52	SAGBEND	-141.06	-55.41	1.35	0.00	0.00	0.00	0.00	650.49	431.25	120.37	431.58
53	SAGBEND	-152.43	-59.83	1.45	0.00	0.00	0.00	0.00	645.43	428.27	114.19	431.95
54	SAGBEND	-163.88	-64.01	1.54	0.00	0.00	0.00	0.00	640.68	449.39	109.99	455.35
55	SAGBEND	-175.43	-67.91	1.60	0.00	0.00	0.00	0.00	636.32	459.01	100.87	466.26
56	SAGBEND	-187.08	-71.54	1.61	0.00	0.00	0.00	0.00	632.40	460.17	85.96	462.54
57	SAGBEND	-198.82	-74.88	1.59	0.00	0.00	0.00	0.00	628.94	459.00	79.58	459.00
58	SAGBEND	-210.64	-77.94	1.57	0.00	0.00	0.00	0.00	625.91	455.11	84.53	455.18
59	SAGBEND	-222.53	-80.66	1.51	0.00	0.00	0.00	0.00	623.25	446.00	84.41	446.12
60	SAGBEND	-234.49	-83.06	1.39	0.00	0.00	0.00	0.00	620.94	442.76	82.64	442.76
61	SAGBEND	-246.50	-85.16	1.24	0.00	0.00	0.00	0.00	618.94	459.00	85.97	460.44
62	SAGBEND	-258.57	-86.95	1.12	0.00	0.00	0.00	0.00	617.28	459.71	83.05	459.92
63	SAGBEND	-270.69	-88.43	0.99	0.00	0.00	0.00	0.00	615.99	462.81	74.81	465.96
64	SAGBEND	-282.83	-89.59	0.82	0.00	0.00	0.00	0.00	615.34	472.49	71.46	475.23
65	SAGBEND	-295.00	-90.41	0.61	0.00	0.00	0.00	0.00	615.40	438.58	-53.64	440.36
66	SAGBEND	-307.19	-90.92	0.41	0.78	-0.55	0.00	0.00	615.85	354.05	-86.83	354.33
67	SAGBEND	-319.38	-91.17	0.23	16.89	-11.31	0.00	0.00	616.64	281.07	-130.21	281.99
68	SEABED	-331.58	-91.26	0.09	23.79	-14.89	0.00	0.00	617.69	156.75	-135.01	168.65
69	SEABED	-343.78	-91.28	0.02	22.43	-12.39	0.00	0.00	618.74	45.34	-113.29	113.98
70	SEABED	-355.98	-91.27	0.00	18.41	3.56	0.00	0.00	619.74	-9.83	-53.90	54.00
71	SEABED	-368.18	-91.27	0.00	16.11	2.52	0.00	0.00	620.89	-5.81	-10.00	11.29
72	SEABED	-380.38	-91.27	0.00	15.18	1.10	0.00	0.00	622.00	-2.08	3.74	3.88
73	SEABED	-392.58	-91.27	0.00	15.22	-0.18	0.00	0.00	623.07	0.52	2.06	2.06
74	SEABED	-404.78	-91.27	0.00	15.21	-0.13	0.00	0.00	624.09	0.33	0.64	0.66
75	SEABED	-416.98	-91.27	0.00	0.00	-0.02	0.00	0.00	625.07	0.00	0.00	0.00

Water Depth 91 m (135°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.96	.00	19.63	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	13.79	.00	-7.57	-.01	20.23	4.51
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	13.78	.00	-6.62	.00	19.41	4.33
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	13.74	.00	-21.21	.00	31.78	7.09
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	13.71	.00	-64.68	.00	68.69	15.33
13	LAYBARGE	44.91	4.73	.00	.000	2.151	51.425	13.70	.00	-71.66	.00	74.62	16.66
14	TENSIONR	35.35	4.30	.00	.000	3.171	60.993	27.57	.00	-159.48	-.02	163.13	36.41
16	LAYBARGE	23.34	3.42	.00	.000	5.432	73.039	27.39	.00	-259.90	.00	248.30	55.42
18	LAYBARGE	8.89	1.61	.00	.000	8.930	87.606	27.06	.00	-317.99	.01	297.34	66.37
20	LAYBARGE	3.11	.61	.00	.000	10.791	93.474	26.86	.00	-362.37	-.13	334.87	74.75
24	STINGER	-7.57	-1.73	.00	-.002	13.627	104.410	26.61	-.28	-215.30	-.81	209.75	46.82
26	STINGER	-16.43	-4.01	.00	-.006	15.285	113.554	26.32	-.64	-181.30	-.64	180.75	40.35
29	STINGER	-26.07	-6.78	.00	-.008	16.583	123.590	25.97	-1.09	-105.63	-.53	116.31	25.96
32	STINGER	-34.82	-9.46	.00	-.011	17.464	132.734	25.61	-1.52	-107.58	-.73	117.82	26.30
35	STINGER	-44.24	-12.51	.01	-.009	18.539	142.643	25.20	-2.01	-133.77	.38	139.92	31.23
38	STINGER	-52.88	-15.53	.01	-.022	20.084	151.787	24.76	-2.49	-235.55	-3.70	226.26	50.50
41	STINGER	-62.04	-19.07	.01	.021	22.100	161.614	24.30	-3.06	-214.24	11.86	208.23	46.48
43	STINGER	-71.98	-23.32	.01	-.159	24.335	172.423	23.71	-3.74	-242.57	-46.13	235.49	52.57
45	STINGER	-74.83	-24.63	.02	-.294	24.969	175.559	23.56	-3.95	-183.80	-36.85	184.92	41.28
47	SAGBEND	-85.76	-29.89	.11	-.589	26.134	187.696	22.90	-4.80	-35.74	-12.40	57.61	12.86
48	SAGBEND	-96.71	-35.28	.23	-.663	26.076	199.896	22.18	-5.66	37.18	-.53	56.82	12.68
49	SAGBEND	-107.70	-40.58	.36	-.629	25.409	212.096	21.47	-6.52	73.69	5.03	87.69	19.57
50	SAGBEND	-118.76	-45.72	.47	-.547	24.432	224.296	20.78	-7.34	92.77	7.44	103.75	23.16
51	SAGBEND	-129.92	-50.66	.57	-.446	23.288	236.495	20.11	-8.13	103.45	8.21	112.61	25.14
52	SAGBEND	-141.17	-55.36	.65	-.342	22.047	248.696	19.49	-8.89	110.04	8.18	117.97	26.33
53	SAGBEND	-152.53	-59.82	.71	-.242	20.743	260.896	18.89	-9.60	114.56	7.81	121.58	27.14
54	SAGBEND	-163.99	-64.00	.74	-.148	19.393	273.096	18.33	-10.28	118.01	7.30	124.29	27.74
55	SAGBEND	-175.54	-67.91	.77	-.062	18.007	285.296	17.81	-10.90	120.85	6.75	126.50	28.24
56	SAGBEND	-187.19	-71.54	.77	.018	16.590	297.496	17.32	-11.49	123.31	6.23	128.40	28.66
57	SAGBEND	-198.93	-74.88	.76	.090	15.146	309.696	16.88	-12.02	125.49	5.73	130.08	29.04
58	SAGBEND	-210.74	-77.92	.73	.156	13.679	321.896	16.47	-12.51	127.42	5.28	131.57	29.37
59	SAGBEND	-222.63	-80.65	.69	.217	12.190	334.096	16.11	-12.95	129.08	4.87	132.85	29.65
60	SAGBEND	-234.59	-83.07	.64	.272	10.684	346.296	15.78	-13.34	130.43	4.48	133.88	29.88
61	SAGBEND	-246.61	-85.17	.58	.323	9.165	358.496	15.50	-13.67	131.35	4.08	134.56	30.04
62	SAGBEND	-258.68	-86.95	.51	.368	7.639	370.697	15.26	-13.96	131.61	3.60	134.70	30.07
63	SAGBEND	-270.79	-88.41	.43	.407	6.115	382.897	15.07	-14.19	130.74	2.94	133.89	29.89
64	SAGBEND	-282.93	-89.55	.34	.435	4.612	395.097	14.92	-14.38	127.87	1.85	131.40	29.33
65	SAGBEND	-295.11	-90.38	.24	.446	3.162	407.298	14.81	-14.51	121.22	-.11	125.73	28.06
66	SAGBEND	-307.29	-90.91	.15	.426	1.827	419.498	14.74	-14.59	107.33	-3.86	114.04	25.45
67	SAGBEND	-319.49	-91.17	.07	.343	.725	431.699	14.71	-14.64	79.40	-11.17	91.07	20.33
68	SEABED	-331.69	-91.25	.01	.149	.083	443.899	14.71	-14.65	27.97	-20.14	52.87	11.80
69	SEABED	-343.89	-91.25	.00	.005	-.033	456.100	14.71	-14.65	-.50	-4.69	28.97	6.47
70	SEABED	-356.09	-91.24	.00	-.008	-.009	468.300	14.71	-14.65	-1.78	.64	26.83	5.99
71	SEABED	-368.29	-91.24	.00	-.001	.001	480.500	14.71	-14.65	-.20	.35	25.72	5.74
72	SEABED	-380.49	-91.24	.00	.000	.001	492.700	14.71	-14.65	.08	.00	25.49	5.69
73	SEABED	-392.69	-91.24	.00	.000	.000	504.900	14.71	-14.65	.02	-.02	25.45	5.68
74	SEABED	-404.89	-91.24	.00	.000	.000	517.100	14.71	-14.65	.00	.00	25.43	5.68
75	SEABED	-417.09	-91.24	.00	.000	.000	529.300	14.71	-14.65	.00	.00	25.43	5.68
76	SEABED	-429.29	-91.24	.00	.000	.000	541.500	14.71	-14.65	.00	.00	25.43	5.68
77	SEABED	-441.49	-91.24	.00	.000	.000	553.700	14.71	-14.65	.00	.00	25.42	5.68
78	SEABED	-453.69	-91.24	.00	.000	.000	565.900	14.71	-14.65	.00	.00	25.42	5.68

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	HORIZ (KN)	SUPT SEPARATIONS VERT (M)	HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	HORIZ (KN-M)	TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.46	.00	.00	.00	-1.36	-77.23	.00	77.23
5	LAYBARGE	73.45	5.65	.00	50.08	.00	.00	.00	-2.64	-67.34	.00	67.34
7	TENSIONR	60.11	5.23	.00	43.22	.05	.00	.00	339.01	-22.20	-.04	22.20
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	338.63	-19.42	.00	19.42

10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	337.84	-62.21	.00	62.21
11	LAYBARGE	46.45	4.79	.00	36.43	.00	.00	.00	337.09	-189.68	.00	189.68
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	336.85	-210.15	.00	210.15
14	TENSIONR	35.35	4.30	.00	69.91	.08	.00	.00	677.79	-467.68	-.06	467.68
16	LAYBARGE	23.34	3.42	.00	101.03	.00	.00	.00	673.16	-762.15	.00	762.15
18	LAYBARGE	8.89	1.61	.00	60.53	.07	.00	.00	665.05	-932.49	.02	932.49
20	LAYBARGE	3.11	.61	.00	113.24	-.40	.00	.00	660.20	-1062.64	-.39	1062.64
24	STINGER	-7.57	-1.73	.00	11.67	-1.35	.00	.00	657.64	-631.35	-2.37	631.36
26	STINGER	-16.43	-4.01	.00	39.80	-1.21	.00	.00	655.12	-531.66	-1.88	531.67
29	STINGER	-26.07	-6.78	.00	.00	-1.12	.00	.00	652.21	-309.77	-1.56	309.77
32	STINGER	-34.82	-9.46	.00	14.71	-1.59	.00	.00	648.87	-315.46	-2.15	315.47
35	STINGER	-44.24	-12.51	.01	.00	.47	.02	.00	644.91	-392.29	1.10	392.29
38	STINGER	-52.88	-15.53	.01	70.74	-7.16	.00	.00	640.25	-690.74	-10.85	690.83
41	STINGER	-62.04	-19.07	.01	20.34	19.11	.00	.00	636.08	-628.26	34.78	629.23
43	STINGER	-71.98	-23.32	.01	86.85	-27.77	.00	.00	630.41	-711.34	-135.29	724.10
45	STINGER	-74.83	-24.63	.02	.00	.00	.53	.01	629.42	-539.00	-108.05	549.73
47	SAGBEND	-85.76	-29.89	.11	.00	.00	.00	.00	623.70	-104.82	-36.38	110.95
48	SAGBEND	-96.71	-35.28	.23	.00	.00	.00	.00	617.00	109.02	-1.55	109.03
49	SAGBEND	-107.70	-40.58	.36	.00	.00	.00	.00	610.30	216.11	14.76	216.61
50	SAGBEND	-118.76	-45.72	.47	.00	.00	.00	.00	603.83	272.05	21.81	272.92
51	SAGBEND	-129.92	-50.66	.57	.00	.00	.00	.00	597.64	303.38	24.08	304.33
52	SAGBEND	-141.17	-55.36	.65	.00	.00	.00	.00	591.75	322.68	24.00	323.57
53	SAGBEND	-152.53	-59.82	.71	.00	.00	.00	.00	586.19	335.95	22.90	336.73
54	SAGBEND	-163.99	-64.00	.74	.00	.00	.00	.00	580.96	346.06	21.39	346.72
55	SAGBEND	-175.54	-67.91	.77	.00	.00	.00	.00	576.08	354.40	19.80	354.95
56	SAGBEND	-187.19	-71.54	.77	.00	.00	.00	.00	571.55	361.61	18.26	362.07
57	SAGBEND	-198.93	-74.88	.76	.00	.00	.00	.00	567.39	368.00	16.82	368.38
58	SAGBEND	-210.74	-77.92	.73	.00	.00	.00	.00	563.60	373.65	15.50	373.97
59	SAGBEND	-222.63	-80.65	.69	.00	.00	.00	.00	560.19	378.53	14.29	378.80
60	SAGBEND	-234.59	-83.07	.64	.00	.00	.00	.00	557.18	382.49	13.14	382.72
61	SAGBEND	-246.61	-85.17	.58	.00	.00	.00	.00	554.55	385.19	11.96	385.38
62	SAGBEND	-258.68	-86.95	.51	.00	.00	.00	.00	552.34	385.94	10.57	386.08
63	SAGBEND	-270.79	-88.41	.43	.00	.00	.00	.00	550.52	383.40	8.62	383.50
64	SAGBEND	-282.93	-89.55	.34	.00	.00	.00	.00	549.13	374.96	5.44	375.00
65	SAGBEND	-295.11	-90.38	.24	.00	.00	.00	.00	548.14	355.46	-.32	355.46
66	SAGBEND	-307.29	-90.91	.15	.00	.00	.00	.00	547.56	314.76	-11.31	314.96
67	SAGBEND	-319.49	-91.17	.07	.55	-.64	.00	.00	547.35	232.85	-32.77	235.14
68	SEABED	-331.69	-91.25	.01	17.75	-8.49	.00	.00	547.41	82.03	-59.05	101.07
69	SEABED	-343.89	-91.25	.00	21.58	2.12	.00	.00	547.43	-1.48	-13.77	13.85
70	SEABED	-356.09	-91.24	.00	15.95	1.35	.00	.00	547.43	-5.21	1.88	5.54
71	SEABED	-368.29	-91.24	.00	14.88	.03	.00	.00	547.43	-.57	1.04	1.19
72	SEABED	-380.49	-91.24	.00	15.09	-.08	.00	.00	547.43	.25	.01	.25
73	SEABED	-392.69	-91.24	.00	15.18	-.01	.00	.00	547.43	.07	-.06	.09
74	SEABED	-404.89	-91.24	.00	15.18	.00	.00	.00	547.43	-.01	-.01	.01
75	SEABED	-417.09	-91.24	.00	15.18	.00	.00	.00	547.43	.00	.00	.01
76	SEABED	-429.29	-91.24	.00	15.17	.00	.00	.00	547.43	.00	.00	.00
77	SEABED	-441.49	-91.24	.00	15.18	.00	.00	.00	547.43	.00	.00	.00
78	SEABED	-453.69	-91.24	.00	.00	.00	.00	.00	547.43	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.33	6.29	0.00	-0.001	1.581	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.29	5.96	0.00	-0.001	1.578	12.04	-0.0001	0.0000	-0.0136	-0.0001	0.0137	0.00
5	LAYBARGE	73.46	5.65	0.00	-0.001	1.751	22.87	-0.0003	0.0000	-0.0113	-0.0001	0.0114	0.00
7	TENSIONR	60.12	5.23	0.00	-0.001	1.781	36.22	0.0074	0.0000	-0.0038	0.0000	0.0111	0.00
9	LAYBARGE	57.09	5.14	0.00	-0.001	1.814	39.25	0.0074	0.0000	-0.0033	0.0000	0.0106	0.00
10	LAYBARGE	51.10	4.94	0.00	0.000	1.868	45.24	0.0074	0.0000	-0.0106	-0.0002	0.0178	0.00
11	LAYBARGE	46.46	4.79	0.00	0.000	2.053	49.89	0.0074	0.0000	-0.0318	-0.0003	0.0389	0.00
13	LAYBARGE	44.93	4.73	0.00	0.000	2.154	51.42	0.0074	0.0000	-0.0350	0.0004	0.0422	0.00
14	TENSIONR	35.37	4.30	0.00	0.001	3.173	60.99	0.0144	0.0000	-0.0778	-0.0009	0.0917	0.00
16	LAYBARGE	23.36	3.42	0.00	0.000	5.431	73.04	0.0144	0.0000	-0.1320	-0.0014	0.1452	0.00
18	LAYBARGE	8.91	1.62	0.00	-0.002	8.878	87.61	0.0143	0.0000	-0.1643	0.0020	0.1782	0.00
20	LAYBARGE	3.12	0.61	0.00	-0.001	10.553	93.47	0.0143	0.0000	-0.2662	0.0028	0.2792	0.00
24	STINGER	-7.62	-1.69	0.00	0.007	13.343	104.46	0.0142	-0.0002	-0.1603	-0.0022	0.1729	0.00
26	STINGER	-16.49	-3.92	0.00	0.007	15.326	113.60	0.0141	-0.0003	-0.1860	-0.0024	0.1986	0.00
29	STINGER	-26.08	-6.70	0.01	0.001	16.408	123.63	0.0140	-0.0006	-0.1145	-0.0016	0.1269	0.00
32	STINGER	-34.82	-9.42	0.01	-0.006	17.430	132.77	0.0139	-0.0008	-0.1252	-0.0019	0.1386	0.00
35	STINGER	-44.29	-12.43	0.01	-0.009	18.433	142.67	0.0137	-0.0010	-0.1827	-0.0020	0.1962	0.00
38	STINGER	-52.92	-15.41	0.01	-0.031	19.965	151.81	0.0135	-0.0012	-0.1728	-0.0040	0.1853	0.00
41	STINGER	-62.07	-18.95	0.01	0.018	22.019	161.63	0.0133	-0.0015	-0.1648	0.0123	0.1775	0.00
43	STINGER	-72.01	-23.20	0.02	-0.190	24.580	172.44	0.0130	-0.0018	-0.1669	-0.0436	0.1825	0.00
45	STINGER	-74.85	-24.52	0.03	-0.315	25.140	175.56	0.0129	-0.0019	-0.1323	-0.0354	0.1474	0.00
47	SAGBEND	-85.81	-29.80	0.13	-0.657	26.225	187.70	0.0126	-0.0023	-0.0432	-0.0144	0.0561	0.00

48	SAGBEND	-96.76	-35.18	0.26	-0.727	26.134	199.90	0.0122	-0.0028	0.0421	-0.0087	0.0536	0.00
49	SAGBEND	-107.74	-40.48	0.41	-0.670	25.526	212.10	0.0118	-0.0032	0.0589	0.0110	0.0707	0.00
50	SAGBEND	-118.80	-45.59	0.53	-0.610	24.593	224.30	0.0115	-0.0036	0.0652	0.0118	0.0771	0.00
51	SAGBEND	-129.96	-50.51	0.62	-0.492	23.450	236.50	0.0112	-0.0040	0.0696	0.0115	0.0815	0.00
52	SAGBEND	-141.21	-55.24	0.70	-0.391	22.203	248.70	0.0109	-0.0043	0.0730	0.0106	0.0850	0.00
53	SAGBEND	-152.55	-59.74	0.77	-0.296	20.877	260.90	0.0106	-0.0047	0.0740	0.0105	0.0862	0.00
54	SAGBEND	-164.00	-64.00	0.83	-0.199	19.529	273.10	0.0103	-0.0050	0.0782	0.0111	0.0909	0.00
55	SAGBEND	-175.55	-67.91	0.87	-0.082	18.144	285.30	0.0100	-0.0053	0.0792	0.0123	0.0911	0.00
56	SAGBEND	-187.20	-71.55	0.88	0.012	16.676	297.50	0.0098	-0.0056	0.0800	0.0128	0.0917	0.00
57	SAGBEND	-198.93	-74.90	0.87	0.086	15.118	309.70	0.0096	-0.0058	0.0798	0.0115	0.0909	0.00
58	SAGBEND	-210.75	-77.91	0.83	0.191	13.692	321.90	0.0094	-0.0061	0.0796	0.0095	0.0906	0.00
59	SAGBEND	-222.64	-80.63	0.77	0.241	12.182	334.10	0.0092	-0.0063	0.0767	0.0093	0.0875	0.00
60	SAGBEND	-234.60	-83.06	0.72	0.301	10.675	346.30	0.0091	-0.0065	0.0744	0.0092	0.0863	0.00
61	SAGBEND	-246.61	-85.17	0.66	0.344	9.231	358.50	0.0090	-0.0066	0.0784	0.0100	0.0906	0.00
62	SAGBEND	-258.67	-86.94	0.59	0.367	7.782	370.70	0.0089	-0.0068	0.0799	0.0121	0.0912	0.00
63	SAGBEND	-270.78	-88.43	0.51	0.440	6.199	382.90	0.0088	-0.0069	0.0830	0.0126	0.0940	0.00
64	SAGBEND	-282.93	-89.59	0.43	0.520	4.617	395.10	0.0088	-0.0070	0.0823	0.0121	0.0936	0.00
65	SAGBEND	-295.10	-90.40	0.33	0.566	3.179	407.30	0.0087	-0.0070	0.0777	0.0106	0.0875	0.00
66	SAGBEND	-307.29	-90.90	0.21	0.556	1.726	419.50	0.0087	-0.0071	0.0633	-0.0091	0.0742	0.00
67	SAGBEND	-319.48	-91.15	0.11	0.467	0.751	431.70	0.0087	-0.0071	0.0482	-0.0193	0.0587	0.00
68	SEABED	-331.68	-91.25	0.03	0.257	0.245	443.90	0.0087	-0.0071	0.0280	-0.0180	0.0401	0.00
69	SEABED	-343.88	-91.28	0.00	0.069	0.011	456.10	0.0088	-0.0071	0.0110	-0.0101	0.0242	0.00
70	SEABED	-356.08	-91.27	0.00	-0.001	-0.028	468.30	0.0088	-0.0071	-0.0020	-0.0030	0.0157	0.00
71	SEABED	-368.28	-91.27	0.00	-0.009	-0.009	480.50	0.0088	-0.0071	-0.0011	0.0007	0.0144	0.00
72	SEABED	-380.48	-91.27	0.00	-0.003	-0.001	492.70	0.0088	-0.0071	-0.0005	0.0004	0.0140	0.00
73	SEABED	-392.68	-91.27	0.00	0.000	0.001	504.90	0.0088	-0.0071	0.0002	0.0001	0.0139	0.00
74	SEABED	-404.88	-91.27	0.00	0.000	0.000	517.10	0.0088	-0.0071	0.0001	-0.0001	0.0138	0.00
75	SEABED	-417.08	-91.27	0.00	0.000	0.000	529.30	0.0089	-0.0071	0.0000	0.0000	0.0138	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.33	6.29	0.00	16.97	0.11	0.00	0.00	0.00	4.69	-0.03	4.69
3	LAYBARGE	84.29	5.96	0.00	57.40	0.19	0.00	0.00	-7.09	-82.82	-0.50	82.82
5	LAYBARGE	73.46	5.65	0.00	51.08	-0.13	0.00	0.00	-13.51	-68.47	-0.36	68.47
7	TENSIONR	60.12	5.23	0.00	44.59	0.55	0.00	0.00	377.28	-22.86	-0.17	22.86
9	LAYBARGE	57.09	5.14	0.00	0.00	0.00	0.00	0.00	377.55	-20.04	0.28	20.04
10	LAYBARGE	51.10	4.94	0.00	0.00	0.00	0.00	0.00	378.00	-64.14	-1.22	64.15
11	LAYBARGE	46.46	4.79	0.00	38.61	0.49	0.00	0.00	378.21	-192.73	-1.61	192.74
13	LAYBARGE	44.93	4.73	0.00	0.00	0.00	0.00	0.00	378.27	-212.55	2.20	212.55
14	TENSIONR	35.37	4.30	0.00	73.77	0.36	0.00	0.00	732.90	-472.16	-5.74	472.17
16	LAYBARGE	23.36	3.42	0.00	120.02	1.56	0.00	0.00	732.23	-801.27	-8.39	801.27
18	LAYBARGE	8.91	1.62	0.00	148.16	-4.12	0.01	0.00	728.67	-997.43	12.04	997.44
20	LAYBARGE	3.12	0.61	0.00	241.64	-8.65	0.05	0.00	725.41	-1462.47	16.09	1462.47
24	STINGER	-7.62	-1.69	0.00	165.32	-10.82	0.31	0.00	725.44	-972.88	-13.17	972.88
26	STINGER	-16.49	-3.92	0.00	221.10	-4.49	0.84	0.00	725.69	-1128.26	-14.57	1128.26
29	STINGER	-26.08	-6.70	0.01	139.60	-3.70	0.80	0.00	725.38	-695.32	-9.65	695.34
32	STINGER	-34.82	-9.42	0.01	266.33	-5.08	0.88	0.00	724.10	-760.10	-11.64	760.16
35	STINGER	-44.29	-12.43	0.01	250.23	-3.55	0.83	0.00	719.78	-1108.37	-11.90	1108.40
38	STINGER	-52.92	-15.41	0.01	150.21	-13.28	0.25	0.00	718.54	-1048.88	-24.06	1049.04
41	STINGER	-62.07	-18.95	0.01	135.76	39.40	0.02	0.00	713.99	-1000.59	74.70	1001.17
43	STINGER	-72.01	-23.20	0.02	128.52	-54.67	0.00	0.00	707.86	-1013.00	-264.54	1036.54
45	STINGER	-74.85	-24.52	0.03	0.00	0.00	0.55	0.02	706.65	-803.23	-214.99	822.36
47	SAGBEND	-85.81	-29.80	0.13	0.00	0.00	0.00	0.00	700.30	-262.50	-87.31	268.83
48	SAGBEND	-96.76	-35.18	0.26	0.00	0.00	0.00	0.00	692.92	255.53	-52.92	256.73
49	SAGBEND	-107.74	-40.48	0.41	0.00	0.00	0.00	0.00	685.43	357.69	67.07	359.72
50	SAGBEND	-118.80	-45.59	0.53	0.00	0.00	0.00	0.00	678.17	395.78	71.86	398.70
51	SAGBEND	-129.96	-50.51	0.62	0.00	0.00	0.00	0.00	671.31	422.58	69.56	425.86
52	SAGBEND	-141.21	-55.24	0.70	0.00	0.00	0.00	0.00	664.80	442.92	64.46	446.15
53	SAGBEND	-152.55	-59.74	0.77	0.00	0.00	0.00	0.00	658.54	449.27	63.56	450.75
54	SAGBEND	-164.00	-64.00	0.83	0.00	0.00	0.00	0.00	652.49	474.75	67.16	477.68
55	SAGBEND	-175.55	-67.91	0.87	0.00	0.00	0.00	0.00	646.63	480.74	74.46	485.48
56	SAGBEND	-187.20	-71.55	0.88	0.00	0.00	0.00	0.00	642.58	485.46	77.46	487.04
57	SAGBEND	-198.93	-74.90	0.87	0.00	0.00	0.00	0.00	639.36	484.62	70.09	487.60
58	SAGBEND	-210.75	-77.91	0.83	0.00	0.00	0.00	0.00	636.57	483.45	57.76	484.72
59	SAGBEND	-222.64	-80.63	0.77	0.00	0.00	0.00	0.00	634.18	465.57	56.57	466.22
60	SAGBEND	-234.60	-83.06	0.72	0.00	0.00	0.00	0.00	632.08	451.34	55.96	452.17
61	SAGBEND	-246.61	-85.17	0.66	0.00	0.00	0.00	0.00	630.31	475.94	60.69	477.24
62	SAGBEND	-258.67	-86.94	0.59	0.00	0.00	0.00	0.00	629.04	484.90	73.75	490.21
63	SAGBEND	-270.78	-88.43	0.51	0.00	0.00	0.00	0.00	628.41	504.06	76.40	508.82
64	SAGBEND	-282.93	-89.59	0.43	0.00	0.00	0.00	0.00	628.34	499.31	73.25	501.54
65	SAGBEND	-295.10	-90.40	0.33	0.00	0.00	0.00	0.00	628.65	471.49	64.58	471.97
66	SAGBEND	-307.29	-90.90	0.21	1.83	-1.24	0.00	0.00	629.20	383.96	-55.42	384.25
67	SAGBEND	-319.48	-91.15	0.11	20.53	-12.98	0.00	0.00	629.98	292.47	-117.19	293.43
68	SEABED	-331.68	-91.25	0.03	24.80	-14.44	0.00	0.00	630.95	169.95	-109.09	172.34
69	SEABED	-343.88	-91.28	0.00	23.46	-6.59	0.00	0.00	631.93	66.53	-61.55	73.23

70	SEABED	-356.08	-91.27	0.00	19.01	2.83	0.00	0.00	632.86	-11.98	-18.08	18.23
71	SEABED	-368.28	-91.27	0.00	16.63	1.26	0.00	0.00	633.74	-6.57	4.35	6.67
72	SEABED	-380.48	-91.27	0.00	15.41	0.37	0.00	0.00	634.58	-2.84	2.23	3.02
73	SEABED	-392.68	-91.27	0.00	15.28	-0.15	0.00	0.00	635.38	0.94	0.82	0.99
74	SEABED	-404.88	-91.27	0.00	15.27	-0.12	0.00	0.00	636.15	0.45	-0.52	0.55
75	SEABED	-417.08	-91.27	0.00	0.00	-0.02	0.00	0.00	636.86	0.00	0.00	0.00

Water Depth 91 m (180°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.34	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.96	.00	19.62	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	13.79	.00	-7.59	.00	20.25	4.52
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	13.78	.00	-6.62	.00	19.41	4.33
10	LAYBARGE	51.09	4.95	.00	.000	1.863	45.242	13.74	.00	-21.15	.00	31.72	7.08
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	13.71	.00	-64.58	.00	68.61	15.31
13	LAYBARGE	44.91	4.73	.00	.000	2.150	51.425	13.70	.00	-71.63	.00	74.59	16.65
14	TENSIONR	35.35	4.30	.00	.000	3.173	60.993	27.57	.00	-159.80	.00	163.40	36.47
16	LAYBARGE	23.34	3.42	.00	.000	5.426	73.039	27.39	.00	-258.22	.00	246.88	55.11
18	LAYBARGE	8.89	1.61	.00	.000	8.957	87.606	27.05	.00	-324.63	.00	302.99	67.63
20	LAYBARGE	3.11	.61	.00	.000	10.718	93.474	26.89	.00	-319.70	.00	298.64	66.66
24	STINGER	-7.61	-1.68	.00	.000	13.194	104.438	26.63	-.27	-185.70	.00	184.61	41.21
26	STINGER	-16.49	-3.89	.00	.000	14.731	113.582	26.33	-.62	-182.30	.00	181.60	40.54
29	STINGER	-26.13	-6.56	.00	.000	16.051	123.592	26.00	-1.05	-110.16	.00	120.17	26.82
32	STINGER	-34.90	-9.16	.00	.000	16.991	132.736	25.65	-1.47	-117.11	.00	125.93	28.11
35	STINGER	-44.35	-12.14	.00	.000	18.149	142.643	25.25	-1.95	-142.38	.00	147.25	32.87
38	STINGER	-53.00	-15.10	.00	.000	19.777	151.788	24.81	-2.42	-246.68	.00	235.71	52.61
41	STINGER	-62.17	-18.60	.00	.000	21.857	161.605	24.36	-2.99	-217.69	.00	210.90	47.08
43	STINGER	-72.12	-22.82	.00	.000	24.211	172.413	23.77	-3.66	-263.29	.00	249.42	55.67
45	STINGER	-74.98	-24.12	.00	.000	24.902	175.552	23.63	-3.87	-200.89	.00	196.35	43.83
47	SAGBEND	-85.92	-29.39	.00	.000	26.204	187.696	22.96	-4.72	-43.56	.00	62.48	13.95
48	SAGBEND	-96.86	-34.79	.00	.000	26.208	199.896	22.24	-5.59	33.77	.00	53.96	12.04
49	SAGBEND	-107.83	-40.13	.00	.000	25.567	212.096	21.53	-6.44	72.42	.00	86.48	19.30
50	SAGBEND	-118.88	-45.30	.00	.000	24.598	224.296	20.83	-7.27	92.53	.00	103.31	23.06
51	SAGBEND	-130.02	-50.27	.00	.000	23.454	236.496	20.17	-8.07	103.70	.00	112.57	25.13
52	SAGBEND	-141.26	-55.00	.00	.000	22.208	248.696	19.53	-8.83	110.52	.00	118.14	26.37
53	SAGBEND	-152.61	-59.49	.00	.000	20.897	260.896	18.93	-9.55	115.14	.00	121.86	27.20
54	SAGBEND	-164.06	-63.70	.00	.000	19.540	273.096	18.37	-10.23	118.63	.00	124.63	27.82
55	SAGBEND	-175.60	-67.65	.00	.000	18.147	285.296	17.84	-10.86	121.47	.00	126.87	28.32
56	SAGBEND	-187.24	-71.30	.00	.000	16.723	297.496	17.36	-11.45	123.91	.00	128.78	28.75
57	SAGBEND	-198.97	-74.66	.00	.000	15.273	309.696	16.91	-11.99	126.05	.00	130.46	29.12
58	SAGBEND	-210.78	-77.73	.00	.000	13.799	321.896	16.50	-12.48	127.94	.00	131.93	29.45
59	SAGBEND	-222.66	-80.48	.00	.000	12.305	334.096	16.13	-12.92	129.56	.00	133.19	29.73
60	SAGBEND	-234.62	-82.92	.00	.000	10.794	346.296	15.80	-13.31	130.88	.00	134.20	29.96
61	SAGBEND	-246.63	-85.05	.00	.000	9.269	358.497	15.52	-13.65	131.76	.00	134.86	30.10
62	SAGBEND	-258.69	-86.85	.00	.000	7.738	370.697	15.28	-13.94	132.00	.00	134.99	30.13
63	SAGBEND	-270.80	-88.33	.00	.000	6.210	382.897	15.08	-14.18	131.15	.00	134.21	29.96
64	SAGBEND	-282.95	-89.49	.00	.000	4.702	395.097	14.93	-14.37	128.36	.00	131.80	29.42
65	SAGBEND	-295.12	-90.34	.00	.000	3.245	407.298	14.81	-14.50	121.92	.00	126.33	28.20
66	SAGBEND	-307.31	-90.88	.00	.000	1.899	419.498	14.75	-14.59	108.53	.00	114.99	25.67
67	SAGBEND	-319.50	-91.16	.00	.000	.778	431.699	14.71	-14.64	81.61	.00	92.27	20.60
68	SEABED	-331.70	-91.25	.00	.000	.103	443.899	14.71	-14.65	30.97	.00	49.99	11.16
69	SEABED	-343.91	-91.25	.00	.000	-.033	456.100	14.71	-14.65	.04	.00	25.46	5.68
70	SEABED	-356.11	-91.24	.00	.000	-.010	468.300	14.71	-14.65	-1.89	.00	26.83	5.99
71	SEABED	-368.31	-91.24	.00	.000	.001	480.500	14.71	-14.65	-.24	.00	25.60	5.72
72	SEABED	-380.51	-91.24	.00	.000	.001	492.700	14.71	-14.65	.08	.00	25.49	5.69
73	SEABED	-392.71	-91.24	.00	.000	.000	504.900	14.71	-14.65	.03	.00	25.44	5.68
74	SEABED	-404.91	-91.24	.00	.000	.000	517.100	14.71	-14.65	.00	.00	25.43	5.68
75	SEABED	-417.11	-91.24	.00	.000	.000	529.300	14.71	-14.65	.00	.00	25.43	5.68
76	SEABED	-429.31	-91.24	.00	.000	.000	541.500	14.71	-14.65	.00	.00	25.42	5.68
77	SEABED	-441.51	-91.24	.00	.000	.000	553.700	14.71	-14.65	.00	.00	25.42	5.68
78	SEABED	-453.71	-91.24	.00	.000	.000	565.900	14.71	-14.65	.00	.00	25.42	5.68

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.47	.00	.00	.00	-1.36	-77.24	.00	77.24
5	LAYBARGE	73.45	5.65	.00	50.06	.00	.00	.00	-2.64	-67.32	.00	67.32
7	TENSIONR	60.11	5.23	.00	43.26	.00	.00	.00	339.02	-22.26	.00	22.26
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	338.63	-19.42	.00	19.42
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	337.84	-62.01	.00	62.01
11	LAYBARGE	46.45	4.79	.00	36.23	.00	.00	.00	337.09	-189.38	.00	189.38
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	336.85	-210.05	.00	210.05
14	TENSIONR	35.35	4.30	.00	70.65	.00	.00	.00	677.79	-468.60	.00	468.60
16	LAYBARGE	23.34	3.42	.00	98.68	.00	.00	.00	673.19	-757.23	.00	757.23
18	LAYBARGE	8.89	1.61	.00	87.18	.00	.00	.00	664.95	-951.99	.00	951.99
20	LAYBARGE	3.11	.61	.00	81.85	.00	.00	.00	660.91	-937.53	.00	937.53
24	STINGER	-7.61	-1.68	.00	2.89	.00	.00	.00	657.98	-544.55	.00	544.55
26	STINGER	-16.49	-3.89	.00	48.50	.00	.00	.00	655.26	-534.59	.00	534.59
29	STINGER	-26.13	-6.56	.00	.00	.00	.01	.00	652.46	-323.06	.00	323.06
32	STINGER	-34.90	-9.16	.00	17.64	.00	.00	.00	649.19	-343.42	.00	343.42
35	STINGER	-44.35	-12.14	.00	.00	.00	.02	.00	645.32	-417.52	.00	417.52

38	STINGER	-53.00	-15.10	.00	74.95	.00	.00	.00	640.64	-723.38	.00	723.38
41	STINGER	-62.17	-18.60	.00	14.31	.00	.00	.00	636.63	-638.37	.00	638.37
43	STINGER	-72.12	-22.82	.00	96.26	.00	.00	.00	630.84	-772.09	.00	772.09
45	STINGER	-74.98	-24.12	.00	.00	.00	.52	.00	629.93	-589.10	.00	589.10
47	SAGBEND	-85.92	-29.39	.00	.00	.00	.00	.00	624.31	-127.75	.00	127.75
48	SAGBEND	-96.86	-34.79	.00	.00	.00	.00	.00	617.61	99.03	.00	99.03
49	SAGBEND	-107.83	-40.13	.00	.00	.00	.00	.00	610.88	212.36	.00	212.36
50	SAGBEND	-118.88	-45.30	.00	.00	.00	.00	.00	604.36	271.33	.00	271.33
51	SAGBEND	-130.02	-50.27	.00	.00	.00	.00	.00	598.12	304.11	.00	304.11
52	SAGBEND	-141.26	-55.00	.00	.00	.00	.00	.00	592.20	324.09	.00	324.09
53	SAGBEND	-152.61	-59.49	.00	.00	.00	.00	.00	586.60	337.66	.00	337.66
54	SAGBEND	-164.06	-63.70	.00	.00	.00	.00	.00	581.33	347.87	.00	347.87
55	SAGBEND	-175.60	-67.65	.00	.00	.00	.00	.00	576.41	356.20	.00	356.20
56	SAGBEND	-187.24	-71.30	.00	.00	.00	.00	.00	571.85	363.36	.00	363.36
57	SAGBEND	-198.97	-74.66	.00	.00	.00	.00	.00	567.66	369.65	.00	369.65
58	SAGBEND	-210.78	-77.73	.00	.00	.00	.00	.00	563.84	375.18	.00	375.18
59	SAGBEND	-222.66	-80.48	.00	.00	.00	.00	.00	560.40	379.95	.00	379.95
60	SAGBEND	-234.62	-82.92	.00	.00	.00	.00	.00	557.35	383.79	.00	383.79
61	SAGBEND	-246.63	-85.05	.00	.00	.00	.00	.00	554.70	386.39	.00	386.39
62	SAGBEND	-258.69	-86.85	.00	.00	.00	.00	.00	552.46	387.09	.00	387.09
63	SAGBEND	-270.80	-88.33	.00	.00	.00	.00	.00	550.62	384.60	.00	384.60
64	SAGBEND	-282.95	-89.49	.00	.00	.00	.00	.00	549.20	376.40	.00	376.40
65	SAGBEND	-295.12	-90.34	.00	.00	.00	.00	.00	548.18	357.54	.00	357.54
66	SAGBEND	-307.31	-90.88	.00	.00	.00	.00	.00	547.58	318.26	.00	318.26
67	SAGBEND	-319.50	-91.16	.00	.34	.00	.00	.00	547.36	239.32	.00	239.32
68	SEABED	-331.70	-91.25	.00	16.57	.00	.00	.00	547.41	90.82	.00	90.82
69	SEABED	-343.91	-91.25	.00	21.97	.00	.00	.00	547.43	.13	.00	.13
70	SEABED	-356.11	-91.24	.00	16.13	.00	.00	.00	547.43	-5.54	.00	5.54
71	SEABED	-368.31	-91.24	.00	14.88	.00	.00	.00	547.43	-.72	.00	.72
72	SEABED	-380.51	-91.24	.00	15.08	.00	.00	.00	547.43	.25	.00	.25
73	SEABED	-392.71	-91.24	.00	15.18	.00	.00	.00	547.43	.08	.00	.08
74	SEABED	-404.91	-91.24	.00	15.18	.00	.00	.00	547.43	-.01	.00	.01
75	SEABED	-417.11	-91.24	.00	15.18	.00	.00	.00	547.43	-.01	.00	.01
76	SEABED	-429.31	-91.24	.00	15.17	.00	.00	.00	547.43	.00	.00	.00
77	SEABED	-441.51	-91.24	.00	15.18	.00	.00	.00	547.43	.00	.00	.00
78	SEABED	-453.71	-91.24	.00	.00	.00	.00	.00	547.43	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.32	6.28	0.00	0.000	1.575	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.29	5.96	0.00	0.000	1.572	12.04	-0.0001	0.0000	-0.0136	0.0000	0.0136	0.00
5	LAYBARGE	73.46	5.65	0.00	0.000	1.745	22.87	-0.0002	0.0000	-0.0112	0.0000	0.0114	0.00
7	TENSIONR	60.11	5.23	0.00	0.000	1.774	36.22	0.0074	0.0000	-0.0037	0.0000	0.0110	0.00
9	LAYBARGE	57.09	5.14	0.00	0.000	1.807	39.25	0.0073	0.0000	-0.0033	0.0000	0.0106	0.00
10	LAYBARGE	51.10	4.95	0.00	0.000	1.863	45.24	0.0073	0.0000	-0.0106	0.0000	0.0178	0.00
11	LAYBARGE	46.46	4.79	0.00	0.000	2.048	49.89	0.0073	0.0000	-0.0318	0.0000	0.0389	0.00
13	LAYBARGE	44.92	4.73	0.00	0.000	2.150	51.42	0.0073	0.0000	-0.0350	0.0000	0.0422	0.00
14	TENSIONR	35.37	4.30	0.00	0.000	3.173	60.99	0.0143	0.0000	-0.0778	0.0000	0.0917	0.00
16	LAYBARGE	23.36	3.42	0.00	0.000	5.426	73.04	0.0143	0.0000	-0.1343	0.0000	0.1474	0.00
18	LAYBARGE	8.90	1.61	0.00	0.000	8.872	87.61	0.0142	0.0000	-0.1643	0.0000	0.1779	0.00
20	LAYBARGE	3.12	0.61	0.00	0.000	10.348	93.47	0.0141	0.0000	-0.2136	0.0000	0.2265	0.00
24	STINGER	-7.61	-1.59	0.00	0.000	12.815	104.45	0.0141	-0.0001	-0.1267	0.0000	0.1391	0.00
26	STINGER	-16.50	-3.73	0.00	0.000	14.669	113.59	0.0140	-0.0003	-0.1771	0.0000	0.1903	0.00
29	STINGER	-26.15	-6.41	0.00	0.000	15.789	123.62	0.0139	-0.0005	-0.1016	0.0000	0.1139	0.00
32	STINGER	-34.93	-9.02	0.00	0.000	16.841	132.76	0.0137	-0.0007	-0.1194	0.0000	0.1329	0.00
35	STINGER	-44.39	-11.91	0.00	0.000	17.923	142.66	0.0135	-0.0010	-0.1735	0.0000	0.1864	0.00
38	STINGER	-53.04	-14.86	0.00	0.000	19.589	151.80	0.0134	-0.0012	-0.1800	0.0000	0.1931	0.00
41	STINGER	-62.22	-18.39	0.00	0.000	21.649	161.62	0.0132	-0.0014	-0.1650	0.0001	0.1768	0.00
43	STINGER	-72.18	-22.56	0.00	0.000	24.297	172.43	0.0129	-0.0018	-0.1723	0.0004	0.1853	0.00
45	STINGER	-75.03	-23.86	0.00	0.000	24.955	175.56	0.0128	-0.0019	-0.1354	0.0003	0.1484	0.00
47	SAGBEND	-85.96	-29.10	0.00	0.000	26.260	187.70	0.0125	-0.0023	-0.0467	-0.0002	0.0597	0.00
48	SAGBEND	-96.91	-34.50	0.00	0.000	26.289	199.90	0.0121	-0.0027	0.0404	0.0002	0.0517	0.00
49	SAGBEND	-107.90	-39.83	0.00	0.000	25.614	212.10	0.0117	-0.0031	0.0565	-0.0002	0.0680	0.00
50	SAGBEND	-118.94	-45.04	0.00	0.000	24.617	224.30	0.0114	-0.0035	0.0641	-0.0002	0.0753	0.00
51	SAGBEND	-130.08	-50.03	0.00	0.000	23.490	236.50	0.0110	-0.0039	0.0674	0.0002	0.0796	0.00
52	SAGBEND	-141.31	-54.76	0.00	0.000	22.332	248.70	0.0107	-0.0043	0.0729	0.0002	0.0853	0.00
53	SAGBEND	-152.65	-59.26	0.00	0.000	21.049	260.90	0.0104	-0.0046	0.0741	0.0002	0.0848	0.00
54	SAGBEND	-164.10	-63.46	0.00	0.000	19.701	273.10	0.0101	-0.0050	0.0737	-0.0002	0.0861	0.00
55	SAGBEND	-175.66	-67.39	0.00	0.000	18.227	285.30	0.0099	-0.0053	0.0774	-0.0002	0.0893	0.00
56	SAGBEND	-187.29	-71.08	0.00	0.000	16.762	297.50	0.0097	-0.0056	0.0802	-0.0002	0.0911	0.00
57	SAGBEND	-199.01	-74.50	0.00	0.000	15.374	309.70	0.0095	-0.0058	0.0801	-0.0002	0.0905	0.00
58	SAGBEND	-210.81	-77.56	0.00	0.000	13.964	321.90	0.0093	-0.0061	0.0791	-0.0002	0.0893	0.00
59	SAGBEND	-222.69	-80.32	0.00	0.000	12.417	334.10	0.0091	-0.0063	0.0771	0.0002	0.0876	0.00
60	SAGBEND	-234.63	-82.77	0.00	0.000	10.823	346.30	0.0090	-0.0065	0.0766	-0.0001	0.0884	0.00
61	SAGBEND	-246.64	-84.92	0.00	0.000	9.442	358.50	0.0088	-0.0066	0.0793	0.0002	0.0911	0.00
62	SAGBEND	-258.70	-86.72	0.00	0.000	7.969	370.70	0.0088	-0.0068	0.0781	0.0002	0.0896	0.00
63	SAGBEND	-270.81	-88.23	0.00	0.000	6.359	382.90	0.0087	-0.0069	0.0800	0.0003	0.0902	0.00
64	SAGBEND	-282.95	-89.45	0.00	0.000	4.855	395.10	0.0086	-0.0070	0.0818	0.0003	0.0932	0.00
65	SAGBEND	-295.12	-90.29	0.00	0.000	3.468	407.30	0.0086	-0.0070	0.0780	-0.0002	0.0894	0.00
66	SAGBEND	-307.30	-90.83	0.00	0.000	1.930	419.50	0.0086	-0.0071	0.0691	-0.0002	0.0793	0.00
67	SAGBEND	-319.50	-91.11	0.00	0.000	0.895	431.70	0.0086	-0.0071	0.0527	-0.0002	0.0629	0.00
68	SEABED	-331.70	-91.24	0.00	0.000	0.318	443.90	0.0086	-0.0071	0.0311	0.0002	0.0421	0.00
69	SEABED	-343.90	-91.28	0.00	0.000	0.036	456.10	0.0086	-0.0071	0.0139	0.0001	0.0256	0.00
70	SEABED	-356.10	-91.27	0.00	0.000	-0.033	468.30	0.0087	-0.0071	0.0024	0.0000	0.0148	0.00
71	SEABED	-368.30	-91.27	0.00	0.000	-0.012	480.50	0.0087	-0.0071	-0.0013	0.0000	0.0143	0.00
72	SEABED	-380.50	-91.27	0.00	0.000	-0.002	492.70	0.0087	-0.0071	-0.0006	0.0000	0.0139	0.00
73	SEABED	-392.70	-91.27	0.00	0.000	0.001	504.90	0.0087	-0.0071	-0.0002	0.0000	0.0137	0.00

74	SEABED	-404.90	-91.27	0.00	0.000	0.000	517.10	0.0087	-0.0071	0.0001	0.0000	0.0137	0.00
75	SEABED	-417.10	-91.27	0.00	0.000	0.000	529.30	0.0088	-0.0071	0.0000	0.0000	0.0137	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT VERT (KN)	REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.32	6.28	0.00	16.84	0.00	0.00	0.00	0.00	4.65	0.00	4.65
3	LAYBARGE	84.29	5.96	0.00	56.98	-0.01	0.00	0.00	-6.59	-82.55	0.01	82.55
5	LAYBARGE	73.46	5.65	0.00	50.51	-0.01	0.00	0.00	-12.56	-68.20	0.00	68.20
7	TENSIONR	60.11	5.23	0.00	43.64	-0.01	0.00	0.00	374.18	-22.59	0.00	22.59
9	LAYBARGE	57.09	5.14	0.00	0.00	0.00	0.00	0.00	373.94	-20.02	0.00	20.02
10	LAYBARGE	51.10	4.95	0.00	0.00	0.00	0.00	0.00	373.40	-64.51	0.02	64.51
11	LAYBARGE	46.46	4.79	0.00	38.55	-0.01	0.00	0.00	372.84	-193.05	0.02	193.05
13	LAYBARGE	44.92	4.73	0.00	0.00	0.00	0.00	0.00	372.67	-212.27	0.03	212.27
14	TENSIONR	35.37	4.30	0.00	73.27	0.00	0.00	0.00	728.75	-471.97	0.09	471.97
16	LAYBARGE	23.36	3.42	0.00	126.13	-0.01	0.00	0.00	727.16	-815.15	0.13	815.15
18	LAYBARGE	8.90	1.61	0.00	49.09	-0.01	0.00	0.00	722.38	-997.17	0.17	997.17
20	LAYBARGE	3.12	0.61	0.00	190.92	0.02	0.06	0.00	719.45	-1284.83	0.17	1284.83
24	STINGER	-7.61	-1.59	0.00	109.91	-0.03	0.25	0.00	719.34	-769.00	0.16	769.00
26	STINGER	-16.50	-3.73	0.00	165.39	-0.03	0.70	0.00	718.97	-1074.61	-0.18	1074.61
29	STINGER	-26.15	-6.41	0.00	89.08	-0.02	0.67	0.00	718.05	-616.81	-0.11	616.81
32	STINGER	-34.93	-9.02	0.00	278.40	0.03	0.82	0.00	717.02	-724.62	0.13	724.62
35	STINGER	-44.39	-11.91	0.00	211.90	-0.05	0.78	0.00	712.97	-1052.80	0.16	1052.80
38	STINGER	-53.04	-14.86	0.00	154.67	-0.10	0.22	0.00	711.93	-1092.17	0.23	1092.17
41	STINGER	-62.22	-18.39	0.00	120.69	0.37	0.04	0.00	707.39	-1001.27	0.67	1001.27
43	STINGER	-72.18	-22.56	0.00	133.90	-0.47	0.00	0.00	700.59	-1045.61	2.26	1045.61
45	STINGER	-75.03	-23.86	0.00	0.00	0.00	0.55	0.00	699.63	-821.66	1.87	821.66
47	SAGBEND	-85.96	-29.10	0.00	0.00	0.00	0.00	0.00	693.72	-283.61	-1.03	283.61
48	SAGBEND	-96.91	-34.50	0.00	0.00	0.00	0.00	0.00	686.40	245.34	1.11	245.34
49	SAGBEND	-107.90	-39.83	0.00	0.00	0.00	0.00	0.00	678.75	343.08	-1.38	343.08
50	SAGBEND	-118.94	-45.04	0.00	0.00	0.00	0.00	0.00	671.19	388.91	-1.30	388.91
51	SAGBEND	-130.08	-50.03	0.00	0.00	0.00	0.00	0.00	664.00	408.92	1.12	408.92
52	SAGBEND	-141.31	-54.76	0.00	0.00	0.00	0.00	0.00	657.21	442.55	1.08	442.55
53	SAGBEND	-152.65	-59.26	0.00	0.00	0.00	0.00	0.00	650.75	449.70	1.03	449.70
54	SAGBEND	-164.10	-63.46	0.00	0.00	0.00	0.00	0.00	644.60	447.66	-1.15	447.66
55	SAGBEND	-175.66	-67.39	0.00	0.00	0.00	0.00	0.00	639.82	469.67	-1.34	469.67
56	SAGBEND	-187.29	-71.08	0.00	0.00	0.00	0.00	0.00	636.43	486.74	-1.35	486.74
57	SAGBEND	-199.01	-74.50	0.00	0.00	0.00	0.00	0.00	633.27	486.48	-1.42	486.48
58	SAGBEND	-210.81	-77.56	0.00	0.00	0.00	0.00	0.00	630.37	480.02	-1.35	480.02
59	SAGBEND	-222.69	-80.32	0.00	0.00	0.00	0.00	0.00	627.74	468.25	1.13	468.25
60	SAGBEND	-234.63	-82.77	0.00	0.00	0.00	0.00	0.00	625.47	465.27	-0.88	465.27
61	SAGBEND	-246.64	-84.92	0.00	0.00	0.00	0.00	0.00	623.68	481.15	0.93	481.15
62	SAGBEND	-258.70	-86.72	0.00	0.00	0.00	0.00	0.00	622.50	474.18	1.04	474.18
63	SAGBEND	-270.81	-88.23	0.00	0.00	0.00	0.00	0.00	621.92	485.41	1.55	485.41
64	SAGBEND	-282.95	-89.45	0.00	0.00	0.00	0.00	0.00	621.85	496.47	1.56	496.47
65	SAGBEND	-295.12	-90.29	0.00	0.00	0.00	0.00	0.00	622.16	473.44	-1.46	473.44
66	SAGBEND	-307.30	-90.83	0.00	0.31	-0.06	0.00	0.00	622.75	419.53	-0.93	419.53
67	SAGBEND	-319.50	-91.11	0.00	15.32	-0.24	0.00	0.00	623.58	319.92	-1.40	319.92
68	SEABED	-331.70	-91.24	0.00	25.58	0.25	0.00	0.00	624.61	188.79	1.42	188.79
69	SEABED	-343.90	-91.28	0.00	24.58	0.09	0.00	0.00	625.64	84.34	0.75	84.34
70	SEABED	-356.10	-91.27	0.00	19.51	-0.04	0.00	0.00	626.61	14.31	0.22	14.31
71	SEABED	-368.30	-91.27	0.00	17.01	0.02	0.00	0.00	627.53	-7.70	-0.07	7.70
72	SEABED	-380.50	-91.27	0.00	15.56	-0.01	0.00	0.00	628.42	-3.45	0.04	3.45
73	SEABED	-392.70	-91.27	0.00	15.29	0.01	0.00	0.00	629.27	-1.13	0.02	1.13
74	SEABED	-404.90	-91.27	0.00	15.27	-0.01	0.00	0.00	630.25	0.43	-0.03	0.43
75	SEABED	-417.10	-91.27	0.00	0.00	0.00	0.00	0.00	631.20	0.00	0.00	0.00

LAMPIRAN C-4

HASIL *OUTPUT SOFTWARE OFFPIPE*

(*WATER DEPTH* = 80 M)

Water Depth 80 m (0°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.33	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.97	.00	19.63	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	9.80	.00	-7.57	.00	16.24	3.62
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	9.79	.00	-6.65	.00	15.44	3.45
10	LAYBARGE	51.09	4.95	.00	.000	1.864	45.242	9.75	.00	-21.21	.00	27.78	6.20
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	9.72	.00	-64.45	.00	64.51	14.40
13	LAYBARGE	44.91	4.73	.00	.000	2.150	51.425	9.71	.00	-71.63	.00	70.60	15.76
14	TENSIONR	35.35	4.30	.00	.000	3.171	60.993	19.59	.00	-159.55	.00	155.21	34.64
16	LAYBARGE	23.34	3.42	.00	.000	5.422	73.039	19.41	.00	-254.97	.00	236.13	52.71
18	LAYBARGE	8.89	1.61	.00	.000	8.959	87.606	19.07	.00	-319.83	.00	290.93	64.94
20	LAYBARGE	3.11	.61	.00	.000	10.724	93.474	18.90	.00	-324.12	.00	294.40	65.72
24	STINGER	-7.62	-1.70	.00	.000	13.375	104.447	18.63	-.27	-210.12	.00	197.37	44.06
26	STINGER	-16.48	-3.95	.00	.000	15.183	113.592	18.33	-.63	-218.68	.00	204.52	45.65
29	STINGER	-26.11	-6.73	.00	.000	16.838	123.617	17.99	-1.08	-142.70	.00	139.82	31.21
32	STINGER	-34.84	-9.47	.00	.000	18.035	132.761	17.62	-1.52	-143.20	.00	140.11	31.27
35	STINGER	-44.22	-12.65	.00	.000	19.451	142.668	17.19	-2.03	-170.23	.00	162.91	36.36
38	STINGER	-52.80	-15.82	.00	.000	21.305	151.812	16.72	-2.54	-269.08	.00	246.72	55.07
41	STINGER	-61.87	-19.58	.00	.000	23.659	161.639	16.23	-3.14	-250.93	.00	231.11	51.59
43	STINGER	-71.68	-24.13	.00	.000	26.083	172.448	15.63	-3.87	-239.35	.00	221.04	49.34
45	STINGER	-74.49	-25.53	.00	.000	26.710	175.587	15.47	-4.10	-181.83	.00	172.10	38.42
47	SAGBEND	-85.24	-31.10	.00	.000	27.820	187.696	14.75	-4.99	-26.20	.00	39.76	8.87
48	SAGBEND	-96.03	-36.79	.00	.000	27.568	199.895	13.99	-5.91	61.26	.00	69.20	15.45
49	SAGBEND	-106.89	-42.34	.00	.000	26.542	212.095	13.24	-6.80	110.97	.00	111.12	24.80
50	SAGBEND	-117.87	-47.66	.00	.000	25.071	224.295	12.52	-7.65	140.13	.00	135.63	30.27
51	SAGBEND	-129.00	-52.67	.00	.000	23.333	236.495	11.85	-8.46	158.04	.00	150.59	33.61
52	SAGBEND	-140.28	-57.31	.00	.000	21.427	248.695	11.23	-9.20	169.67	.00	160.25	35.77
53	SAGBEND	-151.71	-61.57	.00	.000	19.410	260.896	10.66	-9.88	177.67	.00	166.84	37.24
54	SAGBEND	-163.29	-65.41	.00	.000	17.313	273.096	10.14	-10.50	183.40	.00	171.53	38.29
55	SAGBEND	-175.00	-68.83	.00	.000	15.160	285.296	9.68	-11.05	187.46	.00	174.81	39.02
56	SAGBEND	-186.84	-71.79	.00	.000	12.968	297.496	9.29	-11.53	189.95	.00	176.79	39.46
57	SAGBEND	-198.77	-74.30	.00	.000	10.758	309.696	8.95	-11.93	190.62	.00	177.24	39.56
58	SAGBEND	-210.80	-76.35	.00	.000	8.554	321.897	8.68	-12.26	188.71	.00	175.54	39.18
59	SAGBEND	-222.90	-77.93	.00	.000	6.394	334.097	8.47	-12.51	182.86	.00	170.51	38.06
60	SAGBEND	-235.04	-79.07	.00	.000	4.335	346.298	8.32	-12.69	170.62	.00	160.08	35.73
61	SAGBEND	-247.22	-79.79	.00	.000	2.475	358.499	8.23	-12.81	147.72	.00	140.64	31.39
62	SAGBEND	-259.42	-80.15	.00	.000	.976	370.700	8.20	-12.87	106.70	.00	105.91	23.64
63	SEABED	-271.62	-80.25	.00	.000	.113	382.901	8.19	-12.88	38.11	.00	48.34	10.79
64	SEABED	-283.82	-80.25	.00	.000	-.045	395.102	8.20	-12.88	-.75	.00	18.92	4.22
65	SEABED	-296.02	-80.24	.00	.000	-.013	407.302	8.20	-12.88	-2.49	.00	20.13	4.49
66	SEABED	-308.22	-80.24	.00	.000	.001	419.502	8.20	-12.88	-.26	.00	18.58	4.15
67	SEABED	-320.42	-80.24	.00	.000	.001	431.702	8.20	-12.88	.13	.00	18.49	4.13
68	SEABED	-332.62	-80.24	.00	.000	.000	443.902	8.20	-12.88	.03	.00	18.43	4.11
69	SEABED	-344.82	-80.24	.00	.000	.000	456.102	8.20	-12.88	.00	.00	18.41	4.11
70	SEABED	-357.02	-80.24	.00	.000	.000	468.302	8.20	-12.88	.00	.00	18.41	4.11
71	SEABED	-369.22	-80.24	.00	.000	.000	480.502	8.20	-12.88	.00	.00	18.40	4.11

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.46	.00	.00	.00	-1.36	-77.23	.00	77.23
5	LAYBARGE	73.45	5.65	.00	50.08	.00	.00	.00	-2.64	-67.36	.00	67.36
7	TENSIONR	60.11	5.23	.00	43.14	.00	.00	.00	240.92	-22.21	.00	22.21
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	240.54	-19.50	.00	19.50
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	239.75	-62.19	.00	62.19
11	LAYBARGE	46.45	4.79	.00	35.37	.00	.00	.00	239.00	-189.00	.00	189.00
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	238.76	-210.07	.00	210.07
14	TENSIONR	35.35	4.30	.00	66.38	.00	.00	.00	481.61	-467.88	.00	467.88
16	LAYBARGE	23.34	3.42	.00	88.14	.00	.00	.00	477.05	-747.68	.00	747.68
18	LAYBARGE	8.89	1.61	.00	73.12	.00	.00	.00	468.83	-937.90	.00	937.90
20	LAYBARGE	3.11	.61	.00	74.13	.00	.00	.00	464.65	-950.48	.00	950.48
24	STINGER	-7.62	-1.70	.00	.00	.00	.01	.00	461.53	-616.17	.00	616.17
26	STINGER	-16.48	-3.95	.00	51.16	.00	.00	.00	458.63	-641.26	.00	641.26
29	STINGER	-26.11	-6.73	.00	.00	.00	.01	.00	455.85	-418.46	.00	418.46
32	STINGER	-34.84	-9.47	.00	13.83	.00	.00	.00	452.44	-419.95	.00	419.95
35	STINGER	-44.22	-12.65	.00	.00	.00	.02	.00	448.28	-499.20	.00	499.20
38	STINGER	-52.80	-15.82	.00	65.47	.00	.00	.00	443.27	-789.08	.00	789.08
41	STINGER	-61.87	-19.58	.00	28.01	.00	.00	.00	438.83	-735.86	.00	735.86
43	STINGER	-71.68	-24.13	.00	70.65	.00	.00	.00	433.31	-701.90	.00	701.90
45	STINGER	-74.49	-25.53	.00	.00	.00	.52	.00	432.16	-533.20	.00	533.20
47	SAGBEND	-85.24	-31.10	.00	.00	.00	.00	.00	426.02	-76.83	.00	76.83
48	SAGBEND	-96.03	-36.79	.00	.00	.00	.00	.00	418.87	179.63	.00	179.63

49	SAGBEND	-106.89	-42.34	.00	.00	.00	.00	.00	411.75	325.42	.00	325.42
50	SAGBEND	-117.87	-47.66	.00	.00	.00	.00	.00	404.96	410.94	.00	410.94
51	SAGBEND	-129.00	-52.67	.00	.00	.00	.00	.00	398.60	463.45	.00	463.45
52	SAGBEND	-140.28	-57.31	.00	.00	.00	.00	.00	392.73	497.56	.00	497.56
53	SAGBEND	-151.71	-61.57	.00	.00	.00	.00	.00	387.36	521.03	.00	521.03
54	SAGBEND	-163.29	-65.41	.00	.00	.00	.00	.00	382.53	537.82	.00	537.82
55	SAGBEND	-175.00	-68.83	.00	.00	.00	.00	.00	378.25	549.71	.00	549.71
56	SAGBEND	-186.84	-71.79	.00	.00	.00	.00	.00	374.54	557.04	.00	557.04
57	SAGBEND	-198.77	-74.30	.00	.00	.00	.00	.00	371.41	558.98	.00	558.98
58	SAGBEND	-210.80	-76.35	.00	.00	.00	.00	.00	368.89	553.40	.00	553.40
59	SAGBEND	-222.90	-77.93	.00	.00	.00	.00	.00	366.97	536.25	.00	536.25
60	SAGBEND	-235.04	-79.07	.00	.00	.00	.00	.00	365.66	500.35	.00	500.35
61	SAGBEND	-247.22	-79.79	.00	.00	.00	.00	.00	364.94	433.18	.00	433.18
62	SAGBEND	-259.42	-80.15	.00	.45	.00	.00	.00	364.75	312.90	.00	312.90
63	SEABED	-271.62	-80.25	.00	19.73	.00	.00	.00	364.88	111.77	.00	111.77
64	SEABED	-283.82	-80.25	.00	24.00	.00	.00	.00	364.92	-2.21	.00	2.21
65	SEABED	-296.02	-80.24	.00	16.17	.00	.00	.00	364.91	-7.31	.00	7.31
66	SEABED	-308.22	-80.24	.00	14.74	.00	.00	.00	364.91	-.75	.00	.75
67	SEABED	-320.42	-80.24	.00	15.06	.00	.00	.00	364.91	.37	.00	.37
68	SEABED	-332.62	-80.24	.00	15.19	.00	.00	.00	364.91	.09	.00	.09
69	SEABED	-344.82	-80.24	.00	15.18	.00	.00	.00	364.91	-.01	.00	.01
70	SEABED	-357.02	-80.24	.00	15.18	.00	.00	.00	364.91	-.01	.00	.01
71	SEABED	-369.22	-80.24	.00	.00	.00	.00	.00	364.91	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.31	6.28	0.00	0.000	1.574	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.28	5.96	0.00	0.000	1.570	12.04	-0.0001	0.0000	-0.0136	0.0000	0.0137	0.00
5	LAYBARGE	73.45	5.64	0.00	0.000	1.743	22.87	-0.0002	0.0000	-0.0112	0.0000	0.0114	0.00
7	TENSIONR	60.11	5.23	0.00	0.000	1.773	36.22	0.0053	0.0000	-0.0037	0.0000	0.0089	0.00
9	LAYBARGE	57.08	5.14	0.00	0.000	1.806	39.25	0.0053	0.0000	-0.0033	0.0000	0.0085	0.00
10	LAYBARGE	51.09	4.95	0.00	0.000	1.861	45.24	0.0053	0.0000	-0.0107	0.0000	0.0158	0.00
11	LAYBARGE	46.45	4.79	0.00	0.000	2.046	49.89	0.0053	0.0000	-0.0319	0.0000	0.0370	0.00
13	LAYBARGE	44.91	4.73	0.00	0.000	2.147	51.42	0.0053	0.0000	-0.0350	0.0000	0.0401	0.00
14	TENSIONR	35.36	4.30	0.00	0.000	3.165	60.99	0.0102	0.0000	-0.0782	0.0000	0.0882	0.00
16	LAYBARGE	23.35	3.42	0.00	0.000	5.431	73.04	0.0102	0.0000	-0.1331	0.0000	0.1419	0.00
18	LAYBARGE	8.90	1.61	0.00	0.000	8.864	87.61	0.0101	0.0000	-0.1643	0.0000	0.1741	0.00
20	LAYBARGE	3.12	0.61	0.00	0.000	10.523	93.47	0.0100	0.0000	-0.2749	0.0000	0.2845	0.00
24	STINGER	-7.62	-1.66	0.00	0.000	13.439	104.42	0.0099	-0.0001	-0.1436	0.0000	0.1528	0.00
26	STINGER	-16.47	-3.94	0.00	0.000	15.521	113.56	0.0098	-0.0003	-0.1946	0.0000	0.2039	0.00
29	STINGER	-26.08	-6.76	0.00	0.000	17.069	123.59	0.0097	-0.0006	-0.1085	0.0000	0.1168	0.00
32	STINGER	-34.79	-9.57	0.00	0.000	18.274	132.73	0.0096	-0.0008	-0.1240	0.0000	0.1334	0.00
35	STINGER	-44.20	-12.77	0.00	0.000	19.460	142.65	0.0094	-0.0010	-0.1697	0.0000	0.1792	0.00
38	STINGER	-52.76	-15.95	0.00	0.000	21.302	151.80	0.0091	-0.0013	-0.1777	0.0000	0.1860	0.00
41	STINGER	-61.84	-19.73	0.00	0.000	23.573	161.64	0.0089	-0.0015	-0.1971	-0.0002	0.2052	0.00
43	STINGER	-71.65	-24.28	0.00	0.000	26.247	172.45	0.0085	-0.0019	-0.1557	-0.0006	0.1648	0.00
45	STINGER	-74.45	-25.67	0.00	0.000	26.864	175.57	0.0085	-0.0020	-0.1228	-0.0005	0.1319	0.00
47	SAGBEND	-85.20	-31.27	0.00	-0.001	27.888	187.70	0.0081	-0.0025	-0.0337	-0.0003	0.0424	0.00
48	SAGBEND	-95.99	-36.96	0.00	0.000	27.634	199.90	0.0077	-0.0029	0.0499	0.0002	0.0578	0.00
49	SAGBEND	-106.84	-42.54	0.00	0.000	26.591	212.10	0.0073	-0.0033	0.0725	0.0002	0.0811	0.00
50	SAGBEND	-117.83	-47.84	0.00	0.000	25.097	224.30	0.0069	-0.0037	0.0868	-0.0002	0.0942	0.00
51	SAGBEND	-128.96	-52.83	0.00	0.000	23.315	236.50	0.0066	-0.0041	0.0939	0.0003	0.1021	0.00
52	SAGBEND	-140.25	-57.48	0.00	0.000	21.417	248.70	0.0063	-0.0045	0.0997	0.0004	0.1078	0.00
53	SAGBEND	-151.68	-61.75	0.00	0.000	19.380	260.90	0.0061	-0.0048	0.1046	-0.0003	0.1124	0.00
54	SAGBEND	-163.27	-65.61	0.00	0.000	17.262	273.10	0.0058	-0.0051	0.1093	-0.0002	0.1168	0.00
55	SAGBEND	-174.98	-69.02	0.00	0.000	15.027	285.30	0.0056	-0.0054	0.1097	-0.0002	0.1173	0.00
56	SAGBEND	-186.82	-71.98	0.00	-0.001	12.887	297.50	0.0054	-0.0056	0.1072	0.0002	0.1146	0.00
57	SAGBEND	-198.76	-74.38	0.00	0.000	10.669	309.70	0.0053	-0.0058	0.1054	0.0003	0.1132	0.00
58	SAGBEND	-210.79	-76.39	0.00	0.001	8.457	321.90	0.0052	-0.0060	0.1076	0.0004	0.1149	0.00
59	SAGBEND	-222.89	-77.98	0.00	0.000	6.372	334.10	0.0051	-0.0061	0.1091	-0.0004	0.1169	0.00
60	SAGBEND	-235.04	-79.11	0.00	0.001	4.322	346.30	0.0050	-0.0062	0.1046	-0.0003	0.1116	0.00
61	SAGBEND	-247.21	-79.81	0.00	0.000	2.405	358.50	0.0050	-0.0062	0.0872	-0.0002	0.0942	0.00
62	SAGBEND	-259.41	-80.15	0.00	-0.001	0.972	370.70	0.0050	-0.0062	0.0603	-0.0003	0.0668	0.00
63	SEABED	-271.61	-80.27	0.00	0.000	0.222	382.90	0.0050	-0.0062	0.0329	0.0003	0.0405	0.00
64	SEABED	-283.81	-80.28	0.00	0.000	-0.029	395.10	0.0050	-0.0062	0.0096	0.0001	0.0181	0.00
65	SEABED	-296.01	-80.27	0.00	0.000	-0.038	407.30	0.0051	-0.0062	-0.0026	0.0000	0.0116	0.00
66	SEABED	-308.21	-80.27	0.00	0.000	-0.009	419.50	0.0051	-0.0062	-0.0013	0.0000	0.0109	0.00
67	SEABED	-320.41	-80.26	0.00	0.000	0.000	431.70	0.0051	-0.0062	-0.0005	0.0000	0.0101	0.00
68	SEABED	-332.61	-80.27	0.00	0.000	0.002	443.90	0.0051	-0.0062	0.0002	0.0000	0.0099	0.00
69	SEABED	-344.81	-80.27	0.00	0.000	0.000	456.10	0.0051	-0.0062	0.0002	0.0000	0.0099	0.00
70	SEABED	-357.01	-80.27	0.00	0.000	0.000	468.30	0.0052	-0.0062	-0.0001	0.0000	0.0099	0.00
71	SEABED	-369.21	-80.27	0.00	0.000	0.000	480.50	0.0052	-0.0062	0.0000	0.0000	0.0099	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	0.00	16.87	0.00	0.00	0.00	0.00	4.66	0.00	4.66

3	LAYBARGE	84.28	5.96	0.00	57.09	0.00	0.00	0.00	-5.80	-82.77	0.00	82.77
5	LAYBARGE	73.45	5.64	0.00	50.52	0.00	0.00	0.00	-11.07	-68.13	0.00	68.13
7	TENSIONR	60.11	5.23	0.00	43.61	0.01	0.00	0.00	268.79	-22.72	0.00	22.72
9	LAYBARGE	57.08	5.14	0.00	0.00	0.00	0.00	0.00	268.73	-20.23	0.00	20.23
10	LAYBARGE	51.09	4.95	0.00	0.00	0.00	0.00	0.00	268.56	-65.05	-0.02	65.05
11	LAYBARGE	46.45	4.79	0.00	37.90	-0.01	0.00	0.00	268.30	-193.56	-0.02	193.56
13	LAYBARGE	44.91	4.73	0.00	0.00	0.00	0.00	0.00	268.21	-212.53	-0.03	212.53
14	TENSIONR	35.36	4.30	0.00	73.17	0.00	0.00	0.00	521.08	-474.84	-0.08	474.84
16	LAYBARGE	23.35	3.42	0.00	115.86	-0.01	0.00	0.00	518.92	-807.72	-0.11	807.72
18	LAYBARGE	8.90	1.61	0.00	128.27	-0.02	0.02	0.00	513.43	-997.08	-0.15	997.08
20	LAYBARGE	3.12	0.61	0.00	224.95	0.02	0.06	0.00	508.19	-1478.34	0.19	1478.34
24	STINGER	-7.62	-1.66	0.00	113.77	0.01	0.33	0.00	509.29	-871.87	0.14	871.87
26	STINGER	-16.47	-3.94	0.00	182.14	0.02	0.88	0.00	508.92	-1179.38	0.17	1179.38
29	STINGER	-26.08	-6.76	0.00	167.17	0.02	0.84	0.00	507.76	-658.85	0.11	658.85
32	STINGER	-34.79	-9.57	0.00	266.15	-0.03	0.98	0.00	505.73	-752.92	-0.11	752.92
35	STINGER	-44.20	-12.77	0.00	248.04	-0.06	0.94	0.00	501.89	-1029.69	-0.17	1029.69
38	STINGER	-52.76	-15.95	0.00	153.59	0.16	0.28	0.00	497.68	-1078.30	-0.23	1078.30
41	STINGER	61.84	-19.73	0.00	139.51	-0.58	0.02	0.00	491.64	-1193.66	-1.08	1193.66
43	STINGER	-71.65	-24.28	0.00	112.60	-0.69	0.00	0.00	484.05	-945.30	-3.64	945.30
45	STINGER	-74.45	-25.67	0.00	0.00	0.00	0.55	0.00	482.44	-745.68	-2.97	745.68
47	SAGBEND	-85.20	-31.27	0.00	0.00	0.00	0.00	0.00	474.48	-204.28	-1.56	204.29
48	SAGBEND	-95.99	-36.96	0.00	0.00	0.00	0.00	0.00	465.62	302.66	1.13	302.66
49	SAGBEND	-106.84	-42.54	0.00	0.00	0.00	0.00	0.00	457.77	440.08	1.42	440.08
50	SAGBEND	-117.83	-47.84	0.00	0.00	0.00	0.00	0.00	450.61	527.05	-1.50	527.05
51	SAGBEND	-128.96	-52.83	0.00	0.00	0.00	0.00	0.00	444.24	569.85	2.04	569.85
52	SAGBEND	-140.25	-57.48	0.00	0.00	0.00	0.00	0.00	438.21	605.38	2.21	605.38
53	SAGBEND	-151.68	-61.75	0.00	0.00	0.00	0.00	0.00	433.53	635.06	-1.82	635.06
54	SAGBEND	-163.27	-65.61	0.00	0.00	0.00	0.00	0.00	429.26	663.78	-1.27	663.78
55	SAGBEND	-174.98	-69.02	0.00	0.00	0.00	0.00	0.00	425.44	665.86	-0.92	665.86
56	SAGBEND	-186.82	-71.98	0.00	0.00	0.00	0.00	0.00	422.14	650.72	1.45	650.72
57	SAGBEND	-198.76	-74.38	0.00	0.00	0.00	0.00	0.00	419.43	640.06	2.09	640.06
58	SAGBEND	-210.79	-76.39	0.00	0.00	0.00	0.00	0.00	417.91	653.26	2.34	653.26
59	SAGBEND	-222.89	-77.98	0.00	0.00	0.00	0.00	0.00	417.19	662.26	-2.29	662.26
60	SAGBEND	-235.04	-79.11	0.00	0.00	0.00	0.00	0.00	417.10	634.79	-1.77	634.79
61	SAGBEND	-247.21	-79.81	0.00	0.17	-0.09	0.00	0.00	417.31	529.34	-0.96	529.34
62	SAGBEND	-259.41	-80.15	0.00	16.10	-0.33	0.00	0.00	417.88	365.98	-1.88	365.98
63	SEABED	-271.61	-80.27	0.00	30.07	0.30	0.00	0.00	418.81	199.75	1.92	199.75
64	SEABED	-283.81	-80.28	0.00	25.25	-0.08	0.00	0.00	419.81	58.28	0.87	58.28
65	SEABED	-296.01	-80.27	0.00	19.66	-0.05	0.00	0.00	420.70	-15.63	0.22	15.63
66	SEABED	-308.21	-80.27	0.00	16.47	-0.02	0.00	0.00	421.82	-8.16	-0.09	8.16
67	SEABED	-320.41	-80.26	0.00	15.26	0.01	0.00	0.00	422.95	-3.16	-0.05	3.16
68	SEABED	-332.61	-80.27	0.00	15.36	-0.01	0.00	0.00	424.06	1.06	0.03	1.06
69	SEABED	-344.81	-80.27	0.00	15.38	0.00	0.00	0.00	425.16	0.93	-0.02	0.93
70	SEABED	-357.01	-80.27	0.00	15.27	0.01	0.00	0.00	426.33	-0.55	0.04	0.55
71	SEABED	-369.21	-80.27	0.00	0.00	0.00	0.00	0.00	427.45	0.00	0.00	0.00

Water Depth 80 m (45°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.33	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.97	.00	19.63	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	9.80	.00	-7.57	-.01	16.24	3.62
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	9.79	.00	-6.65	.00	15.44	3.45
10	LAYBARGE	51.09	4.95	.00	.000	1.864	45.242	9.75	.00	-21.22	.00	27.79	6.20
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	9.72	.00	-64.46	.00	64.52	14.40
13	LAYBARGE	44.91	4.73	.00	.000	2.150	51.425	9.71	.00	-71.64	.00	70.61	15.76
14	TENSIONR	35.35	4.30	.00	.000	3.171	60.993	19.59	.00	-159.51	-.02	155.17	34.64
16	LAYBARGE	23.34	3.42	.00	.000	5.423	73.039	19.41	.00	-255.18	.00	236.31	52.75
18	LAYBARGE	8.89	1.61	.00	.000	8.956	87.606	19.07	.00	-319.00	.01	290.22	64.78
20	LAYBARGE	3.11	.61	.00	.000	10.733	93.474	18.90	.00	-329.47	-.13	298.95	66.73
24	STINGER	-7.61	-1.70	.00	-.002	13.357	104.442	18.64	-.27	-199.60	-.78	188.44	42.06
26	STINGER	-16.48	-3.94	.00	-.005	15.009	113.586	18.34	-.63	-192.92	-.61	182.64	40.77
29	STINGER	-26.11	-6.67	.00	-.007	16.473	123.602	18.00	-1.07	-127.99	-.52	127.33	28.42
32	STINGER	-34.86	-9.34	.00	-.010	17.575	132.746	17.64	-1.50	-135.59	-.69	133.65	29.83
35	STINGER	-44.28	-12.45	.00	-.009	18.950	142.665	17.22	-2.00	-168.89	.29	161.78	36.11
38	STINGER	-52.88	-15.55	.01	-.020	20.818	151.809	16.76	-2.50	-273.71	-3.30	250.69	55.96
41	STINGER	-62.00	-19.23	.01	.018	23.168	161.641	16.28	-3.09	-245.28	10.36	226.52	50.56
43	STINGER	-71.84	-23.70	.01	-.141	25.724	172.450	15.67	-3.81	-271.17	-40.33	250.62	55.94
45	STINGER	-74.66	-25.08	.02	-.262	26.438	175.588	15.51	-4.03	-208.93	-32.74	197.31	44.04
47	SAGBEND	-85.42	-30.63	.10	-.531	27.780	187.696	14.82	-4.92	-40.66	-11.14	53.28	11.89
48	SAGBEND	-96.21	-36.32	.21	-.591	27.652	199.896	14.06	-5.83	53.69	.60	62.82	14.02
49	SAGBEND	-107.06	-41.90	.32	-.540	26.690	212.096	13.30	-6.73	107.18	6.48	108.09	24.13
50	SAGBEND	-118.02	-47.25	.41	-.437	25.249	224.296	12.58	-7.59	138.42	9.01	134.44	30.01
51	SAGBEND	-129.13	-52.29	.48	-.315	23.524	236.496	11.90	-8.39	157.46	9.78	150.37	33.57
52	SAGBEND	-140.39	-56.97	.53	-.192	21.621	248.696	11.27	-9.15	169.71	9.64	160.53	35.83
53	SAGBEND	-151.81	-61.27	.56	-.075	19.601	260.896	10.70	-9.84	178.05	9.08	167.37	37.36
54	SAGBEND	-163.38	-65.15	.56	.033	17.498	273.096	10.18	-10.46	183.95	8.33	172.16	38.43
55	SAGBEND	-175.08	-68.60	.55	.129	15.338	285.296	9.71	-11.01	188.08	7.51	175.48	39.17
56	SAGBEND	-186.90	-71.60	.51	.214	13.140	297.496	9.31	-11.50	190.62	6.64	177.47	39.61
57	SAGBEND	-198.83	-74.15	.46	.288	10.922	309.696	8.97	-11.90	191.33	5.68	177.93	39.72
58	SAGBEND	-210.86	-76.22	.39	.348	8.709	321.897	8.70	-12.24	189.52	4.51	176.27	39.35
59	SAGBEND	-222.95	-77.84	.31	.392	6.538	334.097	8.48	-12.50	183.86	2.90	171.37	38.25
60	SAGBEND	-235.09	-79.01	.23	.413	4.466	346.298	8.33	-12.68	172.00	.47	161.25	35.99
61	SAGBEND	-247.27	-79.75	.14	.397	2.586	358.499	8.24	-12.80	149.82	-3.50	142.45	31.80
62	SAGBEND	-259.46	-80.13	.06	.321	1.055	370.700	8.20	-12.87	110.13	-10.22	109.21	24.38
63	SEABED	-271.66	-80.25	.01	.146	.142	382.901	8.19	-12.88	42.58	-18.83	55.35	12.35
64	SEABED	-283.86	-80.25	.00	.006	-.046	395.102	8.20	-12.88	.09	-4.78	21.77	4.86
65	SEABED	-296.06	-80.24	.00	-.008	-.015	407.302	8.20	-12.88	-2.67	.61	20.31	4.53
66	SEABED	-308.26	-80.24	.00	-.001	.001	419.502	8.20	-12.88	-.33	.36	18.74	4.18
67	SEABED	-320.46	-80.24	.00	.000	.001	431.702	8.20	-12.88	.13	.00	18.49	4.13
68	SEABED	-332.66	-80.24	.00	.000	.000	443.902	8.20	-12.88	.04	-.02	18.43	4.11
69	SEABED	-344.86	-80.24	.00	.000	.000	456.102	8.20	-12.88	.00	.00	18.41	4.11
70	SEABED	-357.06	-80.24	.00	.000	.000	468.302	8.20	-12.88	.00	.00	18.41	4.11
71	SEABED	-369.26	-80.24	.00	.000	.000	480.502	8.20	-12.88	.00	.00	18.40	4.11

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.46	.00	.00	.00	-1.36	-77.23	.00	77.23
5	LAYBARGE	73.45	5.65	.00	50.08	.00	.00	.00	-2.64	-67.36	.00	67.36
7	TENSIONR	60.11	5.23	.00	43.14	.05	.00	.00	240.92	-22.20	-.04	22.20
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	240.54	-19.50	.00	19.50
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	239.75	-62.21	.00	62.21
11	LAYBARGE	46.45	4.79	.00	35.40	.00	.00	.00	239.00	-189.04	.00	189.04
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	238.76	-210.08	.00	210.08
14	TENSIONR	35.35	4.30	.00	66.29	.08	.00	.00	481.61	-467.76	-.06	467.76
16	LAYBARGE	23.34	3.42	.00	88.44	.00	.00	.00	477.05	-748.31	.00	748.31
18	LAYBARGE	8.89	1.61	.00	69.76	.07	.00	.00	468.84	-935.46	.02	935.46
20	LAYBARGE	3.11	.61	.00	81.68	-.41	.00	.00	464.56	-966.18	-.39	966.18
24	STINGER	-7.61	-1.70	.00	.00	-1.33	.00	.00	461.64	-585.34	-2.28	585.34
26	STINGER	-16.48	-3.94	.00	41.65	-1.19	.00	.00	458.91	-565.73	-1.79	565.73
29	STINGER	-26.11	-6.67	.00	.00	-1.12	.01	.00	456.03	-375.32	-1.51	375.32
32	STINGER	-34.86	-9.34	.00	13.91	-1.53	.00	.00	452.65	-397.63	-2.03	397.64
35	STINGER	-44.28	-12.45	.00	.00	.28	.03	.00	448.54	-495.26	.85	495.26
38	STINGER	-52.88	-15.55	.01	70.79	-6.42	.00	.00	443.55	-802.67	-9.68	802.72
41	STINGER	-62.00	-19.23	.01	15.07	16.55	.00	.00	439.33	-719.29	30.38	719.93
43	STINGER	-71.84	-23.70	.01	86.48	-23.34	.00	.00	433.40	-795.20	-118.26	803.94
45	STINGER	-74.66	-25.08	.02	.00	.00	.52	.01	432.43	-612.67	-96.00	620.15
47	SAGBEND	-85.42	-30.63	.10	.00	.00	.00	.00	426.58	-119.23	-32.66	123.63
48	SAGBEND	-96.21	-36.32	.21	.00	.00	.00	.00	419.47	157.46	1.76	157.47

49	SAGBEND	-107.06	-41.90	.32	.00	.00	.00	.00	412.32	314.30	19.00	314.87
50	SAGBEND	-118.02	-47.25	.41	.00	.00	.00	.00	405.48	405.90	26.44	406.76
51	SAGBEND	-129.13	-52.29	.48	.00	.00	.00	.00	399.07	461.75	28.67	462.64
52	SAGBEND	-140.39	-56.97	.53	.00	.00	.00	.00	393.15	497.69	28.27	498.49
53	SAGBEND	-151.81	-61.27	.56	.00	.00	.00	.00	387.73	522.13	26.62	522.81
54	SAGBEND	-163.38	-65.15	.56	.00	.00	.00	.00	382.85	539.42	24.43	539.97
55	SAGBEND	-175.08	-68.60	.55	.00	.00	.00	.00	378.52	551.55	22.02	551.99
56	SAGBEND	-186.90	-71.60	.51	.00	.00	.00	.00	374.77	559.01	19.47	559.34
57	SAGBEND	-198.83	-74.15	.46	.00	.00	.00	.00	371.60	561.08	16.64	561.33
58	SAGBEND	-210.86	-76.22	.39	.00	.00	.00	.00	369.03	555.77	13.21	555.92
59	SAGBEND	-222.95	-77.84	.31	.00	.00	.00	.00	367.07	539.17	8.51	539.24
60	SAGBEND	-235.09	-79.01	.23	.00	.00	.00	.00	365.72	504.38	1.37	504.39
61	SAGBEND	-247.27	-79.75	.14	.00	.00	.00	.00	364.97	439.33	-10.25	439.45
62	SAGBEND	-259.46	-80.13	.06	.24	-.18	.00	.00	364.74	322.94	-29.96	324.33
63	SEABED	-271.66	-80.25	.01	18.16	-7.25	.00	.00	364.87	124.87	-55.23	136.54
64	SEABED	-283.86	-80.25	.00	24.60	1.99	.00	.00	364.92	.27	-14.01	14.01
65	SEABED	-296.06	-80.24	.00	16.45	1.35	.00	.00	364.91	-7.83	1.80	8.03
66	SEABED	-308.26	-80.24	.00	14.74	.03	.00	.00	364.91	-.97	1.06	1.44
67	SEABED	-320.46	-80.24	.00	15.04	-.08	.00	.00	364.91	.37	.01	.37
68	SEABED	-332.66	-80.24	.00	15.19	-.01	.00	.00	364.91	.11	-.06	.12
69	SEABED	-344.86	-80.24	.00	15.19	.00	.00	.00	364.91	-.01	-.01	.01
70	SEABED	-357.06	-80.24	.00	15.18	.00	.00	.00	364.91	-.01	.00	.01
71	SEABED	-369.26	-80.24	.00	.00	.00	.00	.00	364.91	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.32	6.28	0.00	-0.001	1.574	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.29	5.96	0.00	0.000	1.572	12.04	-0.0001	0.0000	-0.0136	-0.0001	0.0137	0.00
5	LAYBARGE	73.46	5.65	0.00	0.000	1.745	22.87	-0.0002	0.0000	-0.0113	0.0000	0.0114	0.00
7	TENSIONR	60.11	5.24	0.00	0.000	1.774	36.22	0.0053	0.0000	-0.0038	0.0000	0.0090	0.00
9	LAYBARGE	57.09	5.14	0.00	0.000	1.807	39.25	0.0053	0.0000	-0.0034	0.0000	0.0086	0.00
10	LAYBARGE	51.10	4.95	0.00	0.000	1.863	45.24	0.0053	0.0000	-0.0108	0.0002	0.0158	0.00
11	LAYBARGE	46.46	4.80	0.00	0.001	2.050	49.89	0.0053	0.0000	-0.0318	0.0002	0.0368	0.00
13	LAYBARGE	44.92	4.74	0.00	0.001	2.152	51.42	0.0053	0.0000	-0.0351	0.0003	0.0401	0.00
14	TENSIONR	35.37	4.31	0.00	0.003	3.171	60.99	0.0102	0.0000	-0.0783	0.0008	0.0882	0.00
16	LAYBARGE	23.35	3.42	0.00	0.003	5.429	73.04	0.0101	0.0000	-0.1316	0.0012	0.1413	0.00
18	LAYBARGE	8.90	1.61	0.00	0.002	8.874	87.61	0.0100	0.0000	-0.1655	0.0016	0.1751	0.00
20	LAYBARGE	3.12	0.61	0.00	-0.003	10.599	93.47	0.0099	0.0000	-0.2940	-0.0027	0.3035	0.00
24	STINGER	-7.61	-1.63	0.00	-0.004	13.365	104.41	0.0099	-0.0002	-0.1430	-0.0026	0.1527	0.00
26	STINGER	-16.47	-3.88	0.00	-0.006	15.316	113.55	0.0098	-0.0003	-0.1883	0.0017	0.1976	0.00
29	STINGER	-26.08	-6.68	0.00	-0.001	16.688	123.58	0.0096	-0.0006	-0.1052	-0.0013	0.1141	0.00
32	STINGER	-34.80	-9.40	0.00	-0.002	17.803	132.72	0.0095	-0.0008	-0.1152	-0.0015	0.1245	0.00
35	STINGER	-44.24	-12.49	0.01	-0.004	18.942	142.64	0.0093	-0.0010	-0.1634	-0.0017	0.1726	0.00
38	STINGER	-52.84	-15.58	0.01	-0.024	20.636	151.78	0.0091	-0.0012	-0.1739	-0.0034	0.1830	0.00
41	STINGER	-61.98	-19.26	0.02	0.025	23.076	161.63	0.0088	-0.0015	-0.1993	0.0132	0.2073	0.00
43	STINGER	-71.83	-23.73	0.02	-0.163	25.848	172.44	0.0085	-0.0019	-0.1654	-0.0450	0.1771	0.00
45	STINGER	-74.65	-25.11	0.03	-0.295	26.563	175.56	0.0084	-0.0020	-0.1307	-0.0378	0.1412	0.00
47	SAGBEND	-85.40	-30.68	0.12	-0.572	27.800	187.70	0.0081	-0.0024	-0.0381	-0.0198	0.0474	0.00
48	SAGBEND	-96.18	-36.38	0.24	-0.715	27.673	199.90	0.0077	-0.0029	0.0481	0.0128	0.0562	0.00
49	SAGBEND	-107.02	-41.95	0.36	-0.635	26.723	212.10	0.0074	-0.0033	0.0687	0.0147	0.0766	0.00
50	SAGBEND	-117.98	-47.25	0.46	-0.473	25.254	224.30	0.0070	-0.0037	0.0823	0.0143	0.0903	0.00
51	SAGBEND	-129.10	-52.29	0.57	-0.347	23.532	236.50	0.0067	-0.0041	0.0910	0.0167	0.0995	0.00
52	SAGBEND	-140.38	-56.99	0.63	-0.241	21.631	248.70	0.0064	-0.0045	0.0981	0.0173	0.1063	0.00
53	SAGBEND	-151.80	-61.29	0.65	-0.068	19.572	260.90	0.0061	-0.0048	0.1017	0.0161	0.1098	0.00
54	SAGBEND	-163.38	-65.20	0.68	0.046	17.434	273.10	0.0059	-0.0051	0.1036	0.0180	0.1110	0.00
55	SAGBEND	-175.07	-68.69	0.67	0.111	15.229	285.30	0.0057	-0.0054	0.1061	0.0178	0.1142	0.00
56	SAGBEND	-186.89	-71.70	0.60	0.203	13.134	297.50	0.0055	-0.0056	0.1069	0.0132	0.1149	0.00
57	SAGBEND	-198.82	-74.17	0.53	0.365	10.951	309.70	0.0053	-0.0058	0.1066	0.0120	0.1142	0.00
58	SAGBEND	-210.85	-76.19	0.49	0.485	8.645	321.90	0.0052	-0.0059	0.1047	0.0145	0.1117	0.00
59	SAGBEND	-222.94	-77.81	0.39	0.474	6.537	334.10	0.0051	-0.0061	0.1054	0.0146	0.1121	0.00
60	SAGBEND	-235.08	-79.01	0.29	0.480	4.510	346.30	0.0051	-0.0062	0.0990	-0.0144	0.1064	0.00
61	SAGBEND	-247.26	-79.76	0.21	0.492	2.613	358.50	0.0050	-0.0062	0.0878	-0.0120	0.0952	0.00
62	SAGBEND	-259.45	-80.13	0.13	0.383	1.088	370.70	0.0050	-0.0062	0.0608	-0.0123	0.0685	0.00
63	SEABED	-271.65	-80.26	0.06	0.282	0.258	382.90	0.0050	-0.0062	0.0341	-0.0185	0.0429	0.00
64	SEABED	-283.85	-80.28	0.01	0.134	-0.020	395.10	0.0050	-0.0062	0.0099	-0.0145	0.0242	0.00
65	SEABED	-296.05	-80.27	0.00	0.011	-0.043	407.30	0.0051	-0.0062	-0.0025	-0.0057	0.0142	0.00
66	SEABED	-308.25	-80.27	0.00	-0.007	-0.012	419.50	0.0051	-0.0062	-0.0015	0.0007	0.0109	0.00
67	SEABED	-320.45	-80.26	0.00	-0.005	0.000	431.70	0.0051	-0.0062	-0.0005	0.0005	0.0102	0.00
68	SEABED	-332.65	-80.27	0.00	0.000	0.002	443.90	0.0051	-0.0062	0.0002	0.0003	0.0099	0.00
69	SEABED	-344.85	-80.27	0.00	0.000	0.001	456.10	0.0051	-0.0062	0.0002	-0.0001	0.0099	0.00
70	SEABED	-357.05	-80.27	0.00	0.000	0.000	468.30	0.0051	-0.0062	0.0001	-0.0001	0.0099	0.00
71	SEABED	-369.25	-80.27	0.00	0.000	0.000	480.50	0.0051	-0.0062	0.0000	0.0000	0.0099	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	HORIZ (KN)	SUPT SEPARATIONS VERT (M)	HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	HORIZ (KN-M)	TOTAL (KN-M)
1	LAYBARGE	96.32	6.28	0.00	16.93	-0.24	0.00	0.00	0.00	4.68	0.07	4.68

3	LAYBARGE	84.29	5.96	0.00	57.31	-0.50	0.00	0.00	-5.33	-82.75	-0.45	82.75
5	LAYBARGE	73.46	5.65	0.00	50.93	0.30	0.00	0.00	-10.21	-68.34	-0.28	68.34
7	TENSIONR	60.11	5.24	0.00	44.21	0.52	0.00	0.00	270.77	-22.79	-0.18	22.79
9	LAYBARGE	57.09	5.14	0.00	0.00	0.00	0.00	0.00	270.89	-20.38	0.21	20.38
10	LAYBARGE	51.10	4.95	0.00	0.00	0.00	0.00	0.00	271.09	-65.38	1.02	65.38
11	LAYBARGE	46.46	4.80	0.00	37.50	0.36	0.00	0.00	271.11	-193.06	1.41	193.06
13	LAYBARGE	44.92	4.74	0.00	0.00	0.00	0.00	0.00	271.12	-213.07	1.87	213.07
14	TENSIONR	35.37	4.31	0.00	72.59	0.35	0.00	0.00	518.30	-475.26	4.79	475.26
16	LAYBARGE	23.35	3.42	0.00	112.92	0.84	0.00	0.00	515.69	-798.69	7.02	798.70
18	LAYBARGE	8.90	1.61	0.00	131.42	-2.36	0.02	0.00	510.00	-1004.33	9.44	1004.33
20	LAYBARGE	3.12	0.61	0.00	234.10	-4.64	0.05	0.00	505.16	-1506.83	-16.58	1506.84
24	STINGER	-7.61	-1.63	0.00	128.91	-7.29	0.37	0.00	507.73	-867.81	-15.82	867.82
26	STINGER	-16.47	-3.88	0.00	179.99	-4.76	1.01	0.00	506.74	-1142.17	10.53	1142.18
29	STINGER	-26.08	-6.68	0.00	163.51	-4.60	0.97	0.00	505.00	-638.36	-7.79	638.36
32	STINGER	-34.80	-9.40	0.00	240.00	-4.29	0.80	0.00	503.36	-699.34	-9.09	699.36
35	STINGER	-44.24	-12.49	0.01	228.47	4.21	0.77	0.00	498.88	-991.90	-10.27	991.90
38	STINGER	-52.84	-15.58	0.01	168.33	-13.46	0.22	0.00	495.00	-1055.17	-20.94	1055.21
41	STINGER	-61.98	-19.26	0.02	135.69	42.97	0.02	0.00	488.48	-1206.11	80.40	1206.27
43	STINGER	-71.83	-23.73	0.02	121.44	-53.83	0.00	0.00	480.65	-1003.84	-273.36	1020.68
45	STINGER	-74.65	-25.11	0.03	0.00	0.00	0.54	0.02	479.78	-793.29	-229.51	802.79
47	SAGBEND	-85.40	-30.68	0.12	0.00	0.00	0.00	0.00	474.18	-231.08	-120.02	234.76
48	SAGBEND	-96.18	-36.38	0.24	0.00	0.00	0.00	0.00	467.40	291.78	77.52	293.72
49	SAGBEND	-107.02	-41.95	0.36	0.00	0.00	0.00	0.00	460.76	416.92	89.26	418.28
50	SAGBEND	-117.98	-47.25	0.46	0.00	0.00	0.00	0.00	454.51	499.52	86.75	499.62
51	SAGBEND	-129.10	-52.29	0.57	0.00	0.00	0.00	0.00	448.59	552.27	101.20	553.34
52	SAGBEND	-140.38	-56.99	0.63	0.00	0.00	0.00	0.00	442.89	595.19	104.90	595.28
53	SAGBEND	-151.80	-61.29	0.65	0.00	0.00	0.00	0.00	437.43	617.37	97.62	619.00
54	SAGBEND	-163.38	-65.20	0.68	0.00	0.00	0.00	0.00	432.36	628.69	109.57	628.77
55	SAGBEND	-175.07	-68.69	0.67	0.00	0.00	0.00	0.00	427.95	644.12	108.19	644.17
56	SAGBEND	-186.89	-71.70	0.60	0.00	0.00	0.00	0.00	424.43	648.67	80.10	648.67
57	SAGBEND	-198.82	-74.17	0.53	0.00	0.00	0.00	0.00	421.81	647.27	72.88	647.27
58	SAGBEND	-210.85	-76.19	0.49	0.00	0.00	0.00	0.00	420.07	635.37	88.23	635.48
59	SAGBEND	-222.94	-77.81	0.39	0.00	0.00	0.00	0.00	419.04	639.72	88.43	640.12
60	SAGBEND	-235.08	-79.01	0.29	0.00	0.00	0.00	0.00	418.47	601.19	-87.34	601.43
61	SAGBEND	-247.26	-79.76	0.21	0.01	-0.43	0.00	0.00	418.49	533.11	-72.85	534.64
62	SAGBEND	-259.45	-80.13	0.13	10.23	-6.31	0.00	0.00	418.84	369.02	-74.85	370.89
63	SEABED	-271.65	-80.26	0.06	27.31	-13.77	0.00	0.00	419.49	207.27	-112.32	212.57
64	SEABED	-283.85	-80.28	0.01	25.09	-10.49	0.00	0.00	420.18	60.19	-88.15	96.74
65	SEABED	-296.05	-80.27	0.00	19.87	3.24	0.00	0.00	420.76	-15.47	-34.52	35.03
66	SEABED	-308.25	-80.27	0.00	16.63	2.09	0.00	0.00	421.31	-8.94	4.33	8.94
67	SEABED	-320.45	-80.26	0.00	15.34	0.72	0.00	0.00	422.17	-3.29	3.19	3.98
68	SEABED	-332.65	-80.27	0.00	15.26	-0.15	0.00	0.00	422.99	1.07	1.52	1.52
69	SEABED	-344.85	-80.27	0.00	15.36	-0.19	0.00	0.00	423.78	1.00	-0.51	1.00
70	SEABED	-357.05	-80.27	0.00	15.25	-0.16	0.00	0.00	424.53	0.50	-0.59	0.60
71	SEABED	-369.25	-80.27	0.00	0.00	-0.03	0.00	0.00	425.24	0.00	0.00	0.00

Water Depth 80 m (90°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.33	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.98	.00	19.64	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	9.80	.00	-7.56	-.02	16.23	3.62
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	9.79	.00	-6.65	.00	15.44	3.45
10	LAYBARGE	51.09	4.95	.00	.000	1.864	45.242	9.75	.00	-21.26	.00	27.82	6.21
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	9.72	.00	-64.53	.00	64.57	14.41
13	LAYBARGE	44.91	4.73	.00	.000	2.150	51.425	9.71	.00	-71.66	.00	70.63	15.76
14	TENSIONR	35.35	4.30	.00	.000	3.170	60.993	19.59	.00	-159.31	-.04	155.00	34.60
16	LAYBARGE	23.34	3.42	.00	.000	5.427	73.039	19.41	.00	-256.24	.00	237.21	52.95
18	LAYBARGE	8.89	1.61	.00	.000	8.939	87.606	19.08	.00	-314.85	.01	286.70	63.99
20	LAYBARGE	3.11	.61	.00	-.001	10.779	93.474	18.88	.00	-356.22	-.27	321.67	71.80
24	STINGER	-7.60	-1.73	.00	-.003	13.616	104.438	18.63	-.28	-214.39	-1.48	201.00	44.87
26	STINGER	-16.46	-4.01	.00	-.010	15.211	113.582	18.34	-.64	-164.64	-1.16	158.62	35.41
29	STINGER	-26.09	-6.75	.00	-.014	16.442	123.599	17.99	-1.08	-106.19	-.97	108.81	24.29
32	STINGER	-34.84	-9.41	.01	-.019	17.357	132.743	17.64	-1.51	-113.73	-1.30	115.08	25.69
35	STINGER	-44.26	-12.46	.01	-.016	18.603	142.642	17.22	-2.00	-163.05	.56	156.82	35.00
38	STINGER	-52.88	-15.50	.01	-.037	20.475	151.786	16.76	-2.49	-280.16	-6.23	256.21	57.19
41	STINGER	-62.02	-19.14	.02	.035	22.910	161.628	16.29	-3.07	-256.63	19.49	236.60	52.81
43	STINGER	-71.88	-23.57	.02	-.264	25.503	172.437	15.68	-3.78	-266.85	-75.63	253.35	56.55
45	STINGER	-74.71	-24.94	.04	-.490	26.207	175.576	15.53	-4.00	-206.05	-61.55	200.35	44.72
47	SAGBEND	-85.50	-30.45	.19	-.999	27.544	187.696	14.84	-4.89	-42.03	-21.48	57.56	12.85
48	SAGBEND	-96.31	-36.10	.39	-1.122	27.447	199.896	14.09	-5.80	49.97	.33	59.67	13.32
49	SAGBEND	-107.18	-41.65	.60	-1.036	26.535	212.095	13.34	-6.69	102.49	11.41	104.50	23.32
50	SAGBEND	-118.15	-46.97	.78	-.851	25.151	224.295	12.62	-7.54	133.59	16.37	130.95	29.23
51	SAGBEND	-129.27	-52.00	.92	-.628	23.480	236.495	11.94	-8.35	152.93	18.05	147.19	32.85
52	SAGBEND	-140.53	-56.68	1.02	-.399	21.627	248.696	11.31	-9.10	165.67	18.05	157.72	35.20
53	SAGBEND	-151.95	-60.98	1.08	-.178	19.650	260.896	10.74	-9.79	174.57	17.22	164.95	36.82
54	SAGBEND	-163.51	-64.88	1.10	.027	17.585	273.096	10.21	-10.42	181.03	16.01	170.14	37.98
55	SAGBEND	-175.20	-68.35	1.07	.213	15.456	285.296	9.75	-10.97	185.71	14.62	173.84	38.80
56	SAGBEND	-187.02	-71.38	1.01	.380	13.282	297.496	9.34	-11.46	188.78	13.12	176.21	39.33
57	SAGBEND	-198.94	-73.95	.92	.527	11.082	309.696	9.00	-11.87	190.02	11.44	177.05	39.52
58	SAGBEND	-210.96	-76.06	.79	.650	8.881	321.897	8.72	-12.21	188.78	9.37	175.81	39.24
59	SAGBEND	-223.05	-77.72	.64	.745	6.715	334.097	8.50	-12.48	183.81	6.53	171.42	38.26
60	SAGBEND	-235.18	-78.92	.48	.798	4.638	346.298	8.34	-12.67	172.88	2.22	162.01	36.16
61	SAGBEND	-247.36	-79.70	.31	.786	2.741	358.499	8.25	-12.80	152.06	-4.78	144.39	32.23
62	SAGBEND	-259.55	-80.11	.15	.668	1.173	370.700	8.20	-12.86	114.55	-16.64	113.57	25.35
63	SEABED	-271.75	-80.24	.04	.374	.191	382.901	8.19	-12.88	49.30	-34.06	66.51	14.85
64	SEABED	-283.95	-80.25	.00	.047	-.045	395.102	8.20	-12.88	1.62	-15.30	29.88	6.67
65	SEABED	-296.15	-80.24	.00	-.017	-.017	407.302	8.20	-12.88	-2.91	.26	20.43	4.56
66	SEABED	-308.35	-80.24	.00	-.005	.001	419.502	8.20	-12.88	-.46	.96	19.13	4.27
67	SEABED	-320.55	-80.24	.00	.001	.001	431.702	8.20	-12.88	.13	.09	18.51	4.13
68	SEABED	-332.75	-80.24	.00	.000	.000	443.902	8.20	-12.88	.04	-.05	18.45	4.12
69	SEABED	-344.95	-80.24	.00	.000	.000	456.102	8.20	-12.88	.00	-.01	18.41	4.11
70	SEABED	-357.15	-80.24	.00	.000	.000	468.302	8.20	-12.88	.00	.00	18.41	4.11
71	SEABED	-369.35	-80.24	.00	.000	.000	480.502	8.20	-12.88	.00	.00	18.40	4.11

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.46	.00	.00	.00	-1.36	-77.22	.00	77.22
5	LAYBARGE	73.45	5.65	.00	50.09	.00	.00	.00	-2.64	-67.38	.00	67.38
7	TENSIONR	60.11	5.23	.00	43.11	.10	.00	.00	240.95	-22.16	-.07	22.16
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	240.57	-19.50	.00	19.50
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	239.78	-62.34	.00	62.34
11	LAYBARGE	46.45	4.79	.00	35.52	.00	.00	.00	239.03	-189.23	.00	189.23
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	238.79	-210.15	.00	210.15
14	TENSIONR	35.35	4.30	.00	65.81	.15	.00	.00	481.64	-467.16	-.11	467.16
16	LAYBARGE	23.34	3.42	.00	89.92	.00	.00	.00	477.06	-751.43	-.01	751.43
18	LAYBARGE	8.89	1.61	.00	53.06	.15	.00	.00	468.94	-923.28	.04	923.28
20	LAYBARGE	3.11	.61	.00	101.66	-.82	.00	.00	464.14	-1044.62	-.78	1044.62
24	STINGER	-7.60	-1.73	.00	11.08	-2.57	.00	.00	461.48	-628.69	-4.34	628.70
26	STINGER	-16.46	-4.01	.00	24.11	-2.30	.00	.00	459.10	-482.81	-3.39	482.82
29	STINGER	-26.09	-6.75	.00	.00	-2.15	.01	.00	456.08	-311.41	-2.86	311.42
32	STINGER	-34.84	-9.41	.01	7.40	-2.92	.00	.00	452.73	-333.51	-3.82	333.53
35	STINGER	-44.26	-12.46	.01	.00	.53	.03	.00	448.61	-478.14	1.64	478.14
38	STINGER	-52.88	-15.50	.01	73.26	-12.09	.00	.00	443.55	-821.57	-18.26	821.77
41	STINGER	-62.02	-19.14	.02	20.89	31.11	.00	.00	439.32	-752.55	57.14	754.72
43	STINGER	-71.88	-23.57	.02	80.38	-43.59	.00	.00	433.55	-782.52	-221.78	813.35
45	STINGER	-74.71	-24.94	.04	.00	.00	.52	.02	432.60	-604.23	-180.49	630.61
47	SAGBEND	-85.50	-30.45	.19	.00	.00	.00	.00	426.82	-123.25	-63.00	138.42
48	SAGBEND	-96.31	-36.10	.39	.00	.00	.00	.00	419.78	146.55	.98	146.55

49	SAGBEND	-107.18	-41.65	.60	.00	.00	.00	.00	412.69	300.55	33.46	302.41
50	SAGBEND	-118.15	-46.97	.78	.00	.00	.00	.00	405.88	391.75	48.02	394.68
51	SAGBEND	-129.27	-52.00	.92	.00	.00	.00	.00	399.49	448.47	52.94	451.58
52	SAGBEND	-140.53	-56.68	1.02	.00	.00	.00	.00	393.57	485.84	52.93	488.71
53	SAGBEND	-151.95	-60.98	1.08	.00	.00	.00	.00	388.15	511.92	50.49	514.40
54	SAGBEND	-163.51	-64.88	1.10	.00	.00	.00	.00	383.24	530.86	46.94	532.94
55	SAGBEND	-175.20	-68.35	1.07	.00	.00	.00	.00	378.89	544.59	42.89	546.28
56	SAGBEND	-187.02	-71.38	1.01	.00	.00	.00	.00	375.09	553.60	38.48	554.94
57	SAGBEND	-198.94	-73.95	.92	.00	.00	.00	.00	371.88	557.24	33.54	558.25
58	SAGBEND	-210.96	-76.06	.79	.00	.00	.00	.00	369.26	553.61	27.48	554.29
59	SAGBEND	-223.05	-77.72	.64	.00	.00	.00	.00	367.25	539.03	19.15	539.37
60	SAGBEND	-235.18	-78.92	.48	.00	.00	.00	.00	365.85	506.96	6.52	507.00
61	SAGBEND	-247.36	-79.70	.31	.00	.00	.00	.00	365.04	445.93	-14.02	446.15
62	SAGBEND	-259.55	-80.11	.15	.07	-.11	.00	.00	364.77	335.91	-48.80	339.43
63	SEABED	-271.75	-80.24	.04	15.72	-11.83	.00	.00	364.86	144.56	-99.89	175.71
64	SEABED	-283.95	-80.25	.00	25.38	.28	.00	.00	364.91	4.75	-44.87	45.12
65	SEABED	-296.15	-80.24	.00	16.90	3.54	.00	.00	364.91	-8.52	.75	8.55
66	SEABED	-308.35	-80.24	.00	14.74	.39	.00	.00	364.91	-1.34	2.82	3.12
67	SEABED	-320.55	-80.24	.00	15.01	-.17	.00	.00	364.91	.37	.27	.46
68	SEABED	-332.75	-80.24	.00	15.18	-.04	.00	.00	364.91	.13	-.14	.19
69	SEABED	-344.95	-80.24	.00	15.19	.01	.00	.00	364.91	-.01	-.03	.03
70	SEABED	-357.15	-80.24	.00	15.18	.00	.00	.00	364.91	-.01	.01	.01
71	SEABED	-369.35	-80.24	.00	.00	.00	.00	.00	364.91	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.31	6.28	0.00	-0.001	1.574	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.28	5.95	0.00	-0.001	1.571	12.04	-0.0001	0.0000	-0.0137	-0.0003	0.0137	0.00
5	LAYBARGE	73.45	5.64	0.00	-0.001	1.744	22.87	-0.0001	0.0000	-0.0113	-0.0002	0.0114	0.00
7	TENSIONR	60.11	5.23	0.00	-0.002	1.773	36.22	0.0053	0.0000	-0.0038	-0.0002	0.0090	0.00
9	LAYBARGE	57.08	5.14	0.00	-0.001	1.806	39.25	0.0053	0.0000	-0.0033	0.0001	0.0085	0.00
10	LAYBARGE	51.09	4.95	0.00	-0.002	1.862	45.24	0.0053	0.0000	-0.0108	0.0004	0.0158	0.00
11	LAYBARGE	46.45	4.79	0.00	-0.002	2.048	49.89	0.0053	0.0000	-0.0320	-0.0004	0.0370	0.00
13	LAYBARGE	44.92	4.73	0.00	-0.002	2.149	51.42	0.0053	0.0000	-0.0350	-0.0006	0.0401	0.00
14	TENSIONR	35.36	4.31	0.00	-0.002	3.164	60.99	0.0102	0.0000	-0.0785	-0.0016	0.0881	0.00
16	LAYBARGE	23.35	3.42	0.00	-0.003	5.418	73.04	0.0101	0.0000	-0.1368	0.0024	0.1457	0.00
18	LAYBARGE	8.90	1.62	0.00	-0.002	8.771	87.61	0.0100	0.0000	-0.1660	-0.0038	0.1747	0.00
20	LAYBARGE	3.12	0.61	0.00	0.000	10.390	93.47	0.0099	0.0000	-0.2833	0.0051	0.2919	0.00
24	STINGER	-7.62	-1.66	0.00	-0.001	13.311	104.44	0.0098	-0.0002	-0.1396	-0.0069	0.1491	0.00
26	STINGER	-16.48	-3.87	0.01	-0.006	15.141	113.58	0.0097	-0.0003	-0.1847	0.0037	0.1932	0.00
29	STINGER	-26.08	-6.63	0.02	-0.010	16.338	123.61	0.0095	-0.0006	-0.1196	-0.0028	0.1281	0.00
32	STINGER	-34.82	-9.33	0.02	-0.018	17.723	132.75	0.0094	-0.0008	-0.1374	-0.0037	0.1460	0.00
35	STINGER	-44.27	-12.43	0.01	-0.026	19.026	142.65	0.0092	-0.0010	-0.1790	-0.0039	0.1875	0.00
38	STINGER	-52.88	-15.52	0.02	-0.063	20.774	151.80	0.0089	-0.0012	-0.1866	-0.0069	0.1958	0.00
41	STINGER	-62.00	-19.18	0.03	0.022	23.176	161.64	0.0087	-0.0015	-0.1771	0.0239	0.1856	0.00
43	STINGER	-71.85	-23.63	0.04	-0.317	25.872	172.45	0.0084	-0.0019	-0.1653	-0.0820	0.1849	0.00
45	STINGER	-74.66	-25.01	0.06	-0.537	26.522	175.57	0.0083	-0.0020	-0.1315	-0.0675	0.1487	0.00
47	SAGBEND	-85.47	-30.56	0.22	-1.053	27.702	187.70	0.0080	-0.0024	-0.0410	-0.0299	0.0522	0.00
48	SAGBEND	-96.27	-36.22	0.44	-1.202	27.608	199.90	0.0076	-0.0028	0.0455	-0.0169	0.0545	0.00
49	SAGBEND	-107.13	-41.74	0.65	-1.110	26.602	212.10	0.0073	-0.0033	0.0696	0.0216	0.0775	0.00
50	SAGBEND	-118.11	-47.04	0.84	-0.893	25.184	224.30	0.0069	-0.0037	0.0843	0.0234	0.0938	0.00
51	SAGBEND	-129.24	-52.05	1.01	-0.652	23.488	236.50	0.0066	-0.0041	0.0947	0.0247	0.1038	0.00
52	SAGBEND	-140.52	-56.70	1.14	-0.424	21.528	248.70	0.0063	-0.0044	0.0989	0.0231	0.1075	0.00
53	SAGBEND	-151.95	-61.01	1.22	-0.183	19.506	260.90	0.0061	-0.0048	0.1014	0.0222	0.1102	0.00
54	SAGBEND	-163.52	-64.91	1.25	0.046	17.481	273.10	0.0058	-0.0051	0.1032	0.0220	0.1115	0.00
55	SAGBEND	-175.21	-68.37	1.22	0.158	15.365	285.30	0.0056	-0.0053	0.1039	0.0209	0.1115	0.00
56	SAGBEND	-187.02	-71.39	1.13	0.367	13.282	297.50	0.0054	-0.0056	0.1032	0.0220	0.1116	0.00
57	SAGBEND	-198.94	-73.96	1.01	0.585	11.150	309.70	0.0053	-0.0058	0.1049	0.0194	0.1119	0.00
58	SAGBEND	-210.95	-76.08	0.94	0.748	8.909	321.90	0.0052	-0.0059	0.1052	0.0187	0.1132	0.00
59	SAGBEND	-223.04	-77.77	0.80	0.840	6.661	334.10	0.0051	-0.0061	0.1090	0.0197	0.1161	0.00
60	SAGBEND	-235.18	-79.00	0.60	0.905	4.651	346.30	0.0050	-0.0062	0.1027	0.0162	0.1097	0.00
61	SAGBEND	-247.35	-79.76	0.41	0.984	2.636	358.50	0.0050	-0.0062	0.0835	-0.0157	0.0905	0.00
62	SAGBEND	-259.54	-80.13	0.24	0.805	1.072	370.70	0.0050	-0.0062	0.0631	-0.0212	0.0704	0.00
63	SEABED	-271.74	-80.26	0.10	0.523	0.252	382.90	0.0050	-0.0062	0.0347	-0.0269	0.0440	0.00
64	SEABED	-283.94	-80.28	0.02	0.232	-0.026	395.10	0.0050	-0.0062	0.0101	-0.0221	0.0306	0.00
65	SEABED	-296.14	-80.27	-0.01	0.026	-0.042	407.30	0.0051	-0.0062	-0.0023	-0.0097	0.0181	0.00
66	SEABED	-308.34	-80.27	0.00	-0.018	-0.011	419.50	0.0051	-0.0062	-0.0015	-0.0011	0.0108	0.00
67	SEABED	-320.54	-80.26	0.00	-0.009	0.000	431.70	0.0051	-0.0062	-0.0005	0.0008	0.0103	0.00
68	SEABED	-332.74	-80.27	0.00	-0.001	0.002	443.90	0.0051	-0.0062	0.0001	0.0004	0.0099	0.00
69	SEABED	-344.94	-80.27	0.00	0.000	0.001	456.10	0.0051	-0.0062	0.0001	0.0001	0.0099	0.00
70	SEABED	-357.14	-80.27	0.00	0.000	0.000	468.30	0.0051	-0.0062	0.0001	-0.0001	0.0099	0.00
71	SEABED	-369.34	-80.27	0.00	0.000	0.000	480.50	0.0052	-0.0062	0.0000	0.0000	0.0099	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	HORIZ (KN)	SUPT SEPARATIONS VERT (M)	HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	HORIZ (KN-M)	TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	0.00	17.15	1.01	0.00	0.00	0.00	4.74	-0.28	4.74

3	LAYBARGE	84.28	5.95	0.00	57.80	2.50	0.00	0.00	-3.88	-82.99	-1.70	82.99
5	LAYBARGE	73.45	5.64	0.00	51.49	2.18	0.00	0.00	-7.42	-68.76	-1.33	68.76
7	TENSIONR	60.11	5.23	0.00	44.95	3.01	0.00	0.00	269.33	-22.94	-1.21	22.94
9	LAYBARGE	57.08	5.14	0.00	0.00	0.00	0.00	0.00	269.30	-20.23	0.42	20.23
10	LAYBARGE	51.09	4.95	0.00	0.00	0.00	0.00	0.00	269.20	-65.28	2.70	65.28
11	LAYBARGE	46.45	4.79	0.00	39.23	2.53	0.00	0.00	268.96	-194.49	-2.69	194.49
13	LAYBARGE	44.92	4.73	0.00	0.00	0.00	0.00	0.00	268.89	-212.54	-3.46	212.54
14	TENSIONR	35.36	4.31	0.00	71.72	-1.77	0.00	0.00	516.75	-476.59	-9.89	476.62
16	LAYBARGE	23.35	3.42	0.00	126.86	2.84	0.00	0.00	513.91	-830.34	14.65	830.34
18	LAYBARGE	8.90	1.62	0.00	133.41	-13.89	0.02	0.00	507.74	-1007.53	-23.00	1007.60
20	LAYBARGE	3.12	0.61	0.00	214.67	-10.83	0.08	0.00	503.52	-1491.76	30.87	1491.83
24	STINGER	-7.62	-1.66	0.00	104.38	-28.10	0.46	0.00	502.68	-847.11	-42.18	847.16
26	STINGER	-16.48	-3.87	0.01	178.66	-9.37	1.27	0.00	502.13	-1120.43	22.74	1120.43
29	STINGER	-26.08	-6.63	0.02	138.45	-8.54	1.22	0.00	499.88	-726.29	-17.24	726.39
32	STINGER	-34.82	-9.33	0.02	131.67	-6.37	0.47	0.00	496.72	-834.17	-22.31	834.19
35	STINGER	-44.27	-12.43	0.01	139.15	5.86	0.44	0.00	492.35	-1086.16	-23.91	1086.29
38	STINGER	-52.88	-15.52	0.02	113.58	-24.03	0.11	0.00	486.96	-1131.92	-41.99	1132.34
41	STINGER	-62.00	-19.18	0.03	117.70	75.67	0.02	0.00	482.41	-1074.43	144.93	1076.56
43	STINGER	-71.85	-23.63	0.04	114.16	-95.85	0.00	0.00	476.23	-1003.26	-497.79	1069.85
45	STINGER	-74.66	-25.01	0.06	0.00	0.00	0.54	0.04	475.26	-798.00	-409.76	850.58
47	SAGBEND	-85.47	-30.56	0.22	0.00	0.00	0.00	0.00	469.15	-248.95	-181.48	264.22
48	SAGBEND	-96.27	-36.22	0.44	0.00	0.00	0.00	0.00	461.62	276.28	-102.78	279.17
49	SAGBEND	-107.13	-41.74	0.65	0.00	0.00	0.00	0.00	453.91	422.74	131.23	424.07
50	SAGBEND	-118.11	-47.04	0.84	0.00	0.00	0.00	0.00	447.36	511.97	141.83	518.59
51	SAGBEND	-129.24	-52.05	1.01	0.00	0.00	0.00	0.00	441.77	574.89	149.83	580.98
52	SAGBEND	-140.52	-56.70	1.14	0.00	0.00	0.00	0.00	436.67	600.37	139.96	604.47
53	SAGBEND	-151.95	-61.01	1.22	0.00	0.00	0.00	0.00	432.02	615.73	134.60	621.10
54	SAGBEND	-163.52	-64.91	1.25	0.00	0.00	0.00	0.00	427.88	626.30	133.51	631.71
55	SAGBEND	-175.21	-68.37	1.22	0.00	0.00	0.00	0.00	424.33	630.46	126.65	633.66
56	SAGBEND	-187.02	-71.39	1.13	0.00	0.00	0.00	0.00	421.43	626.72	133.47	630.29
57	SAGBEND	-198.94	-73.96	1.01	0.00	0.00	0.00	0.00	419.21	636.75	118.05	637.35
58	SAGBEND	-210.95	-76.08	0.94	0.00	0.00	0.00	0.00	417.68	638.72	113.75	647.18
59	SAGBEND	-223.04	-77.77	0.80	0.00	0.00	0.00	0.00	416.80	661.68	119.67	664.34
60	SAGBEND	-235.18	-79.00	0.60	0.00	0.00	0.00	0.00	416.51	623.59	98.63	625.76
61	SAGBEND	-247.35	-79.76	0.41	0.04	-0.05	0.00	0.00	416.75	506.95	-95.33	507.45
62	SAGBEND	-259.54	-80.13	0.24	13.42	-8.99	0.00	0.00	417.46	382.89	-128.98	386.14
63	SEABED	-271.74	-80.26	0.10	27.93	-17.11	0.00	0.00	418.53	210.37	-163.08	221.87
64	SEABED	-283.94	-80.28	0.02	25.04	-13.52	0.00	0.00	419.59	61.11	-134.26	136.49
65	SEABED	-296.14	-80.27	-0.01	19.80	4.78	0.00	0.00	420.57	-13.68	-59.13	59.99
66	SEABED	-308.34	-80.27	0.00	16.35	3.25	0.00	0.00	421.51	-8.84	-6.57	9.68
67	SEABED	-320.54	-80.26	0.00	15.17	1.15	0.00	0.00	422.42	-2.95	4.63	4.98
68	SEABED	-332.74	-80.27	0.00	15.22	-0.20	0.00	0.00	423.30	0.83	2.41	2.41
69	SEABED	-344.94	-80.27	0.00	15.26	-0.15	0.00	0.00	424.13	0.75	0.43	0.76
70	SEABED	-357.14	-80.27	0.00	15.23	-0.08	0.00	0.00	424.93	0.32	-0.47	0.47
71	SEABED	-369.34	-80.27	0.00	0.00	0.01	0.00	0.00	425.69	0.00	0.00	0.00

Water Depth 80 m (135°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.33	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.98	.00	19.64	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	9.80	.00	-7.55	-.01	16.22	3.62
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	9.79	.00	-6.65	.00	15.44	3.45
10	LAYBARGE	51.09	4.95	.00	.000	1.864	45.242	9.75	.00	-21.29	.00	27.85	6.22
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	9.72	.00	-64.58	.00	64.61	14.42
13	LAYBARGE	44.91	4.73	.00	.000	2.151	51.425	9.71	.00	-71.68	.00	70.64	15.77
14	TENSIONR	35.35	4.30	.00	.000	3.169	60.993	19.59	.00	-159.16	-.02	154.88	34.57
16	LAYBARGE	23.34	3.42	.00	.000	5.430	73.039	19.41	.00	-257.03	.00	237.89	53.10
18	LAYBARGE	8.89	1.61	.00	.000	8.927	87.606	19.08	.00	-311.75	.01	284.07	63.41
20	LAYBARGE	3.11	.61	.00	.000	10.814	93.474	18.87	.00	-376.15	-.14	338.59	75.58
24	STINGER	-7.59	-1.75	.00	-.002	13.830	104.433	18.62	-.28	-229.81	-.78	214.10	47.79
26	STINGER	-16.43	-4.09	.00	-.005	15.705	113.578	18.31	-.66	-214.57	-.61	201.02	44.87
29	STINGER	-26.05	-6.95	.00	-.007	17.278	123.613	17.96	-1.12	-128.76	-.52	127.97	28.57
32	STINGER	-34.76	-9.74	.00	-.010	18.299	132.757	17.59	-1.56	-115.55	-.69	116.60	26.03
35	STINGER	-44.14	-12.95	.00	-.009	19.483	142.672	17.16	-2.08	-147.26	.28	143.38	32.00
38	STINGER	-52.72	-16.11	.01	-.020	21.130	151.817	16.70	-2.59	-243.27	-3.25	224.80	50.18
41	STINGER	-61.82	-19.82	.01	.018	23.257	161.640	16.21	-3.18	-226.75	10.19	210.75	47.04
43	STINGER	-71.66	-24.29	.01	-.139	25.544	172.449	15.61	-3.90	-235.67	-39.62	220.71	49.27
45	STINGER	-74.48	-25.65	.02	-.257	26.163	175.584	15.45	-4.12	-180.46	-32.15	173.35	38.69
47	SAGBEND	-85.28	-31.13	.10	-.521	27.295	187.696	14.75	-5.00	-30.82	-11.03	45.28	10.11
48	SAGBEND	-96.12	-36.72	.20	-.582	27.116	199.895	14.00	-5.90	53.67	.43	62.77	14.01
49	SAGBEND	-107.02	-42.20	.31	-.534	26.186	212.095	13.26	-6.78	102.38	6.19	104.00	23.21
50	SAGBEND	-118.03	-47.46	.41	-.435	24.814	224.295	12.55	-7.62	131.74	8.73	128.76	28.74
51	SAGBEND	-129.18	-52.42	.48	-.317	23.170	236.495	11.89	-8.42	150.42	9.54	144.40	32.23
52	SAGBEND	-140.46	-57.05	.53	-.197	21.347	248.695	11.27	-9.16	163.07	9.48	154.89	34.57
53	SAGBEND	-151.90	-61.30	.56	-.081	19.399	260.896	10.70	-9.84	172.14	8.99	162.36	36.24
54	SAGBEND	-163.48	-65.14	.56	.025	17.361	273.096	10.18	-10.46	178.88	8.31	167.87	37.47
55	SAGBEND	-175.19	-68.57	.55	.122	15.255	285.296	9.72	-11.01	183.87	7.55	171.91	38.37
56	SAGBEND	-187.01	-71.56	.51	.207	13.100	297.496	9.32	-11.49	187.23	6.72	174.59	38.97
57	SAGBEND	-198.95	-74.10	.46	.282	10.917	309.696	8.98	-11.90	188.69	5.80	175.69	39.22
58	SAGBEND	-210.97	-76.18	.40	.344	8.731	321.897	8.70	-12.23	187.59	4.66	174.64	38.98
59	SAGBEND	-223.06	-77.80	.32	.390	6.578	334.097	8.49	-12.49	182.62	3.09	170.33	38.02
60	SAGBEND	-235.20	-78.98	.23	.413	4.516	346.298	8.34	-12.68	171.48	.69	160.81	35.89
61	SAGBEND	-247.38	-79.74	.15	.401	2.637	358.499	8.24	-12.80	150.14	-3.21	142.72	31.86
62	SAGBEND	-259.57	-80.13	.07	.328	1.097	370.700	8.20	-12.86	111.55	-9.82	110.38	24.64
63	SEABED	-271.77	-80.25	.01	.159	.160	382.901	8.19	-12.88	45.03	-18.50	57.11	12.75
64	SEABED	-283.97	-80.25	.00	.010	-.045	395.102	8.20	-12.88	.64	-5.59	22.39	5.00
65	SEABED	-296.17	-80.24	.00	-.009	-.016	407.302	8.20	-12.88	-2.76	.50	20.35	4.54
66	SEABED	-308.37	-80.24	.00	-.002	.001	419.502	8.20	-12.88	-.38	.40	18.78	4.19
67	SEABED	-320.57	-80.24	.00	.000	.001	431.702	8.20	-12.88	.13	.01	18.49	4.13
68	SEABED	-332.77	-80.24	.00	.000	.000	443.902	8.20	-12.88	.04	-.02	18.44	4.11
69	SEABED	-344.97	-80.24	.00	.000	.000	456.102	8.20	-12.88	.00	.00	18.41	4.11
70	SEABED	-357.17	-80.24	.00	.000	.000	468.302	8.20	-12.88	.00	.00	18.41	4.11
71	SEABED	-369.37	-80.24	.00	.000	.000	480.502	8.20	-12.88	.00	.00	18.40	4.11

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.46	.00	.00	.00	-1.36	-77.22	.00	77.22
5	LAYBARGE	73.45	5.65	.00	50.10	.00	.00	.00	-2.64	-67.39	.00	67.39
7	TENSIONR	60.11	5.23	.00	43.09	.05	.00	.00	240.93	-22.13	-.04	22.13
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	240.54	-19.50	.00	19.50
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	239.75	-62.43	.00	62.43
11	LAYBARGE	46.45	4.79	.00	35.62	.00	.00	.00	239.00	-189.37	.00	189.37
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	238.76	-210.20	.00	210.20
14	TENSIONR	35.35	4.30	.00	65.46	.08	.00	.00	481.62	-466.72	-.06	466.72
16	LAYBARGE	23.34	3.42	.00	91.02	.00	.00	.00	477.02	-753.75	.00	753.75
18	LAYBARGE	8.89	1.61	.00	40.62	.07	.00	.00	468.96	-914.21	.02	914.21
20	LAYBARGE	3.11	.61	.00	115.41	-.41	.00	.00	463.76	-1103.06	-.40	1103.06
24	STINGER	-7.59	-1.75	.00	.00	-1.33	.00	.00	461.26	-673.92	-2.28	673.93
26	STINGER	-16.43	-4.09	.00	45.72	-1.19	.00	.00	458.52	-629.21	-1.80	629.21
29	STINGER	-26.05	-6.95	.00	.00	-1.12	.00	.00	455.68	-377.60	-1.51	377.60
32	STINGER	-34.76	-9.74	.00	5.71	-1.53	.00	.00	452.28	-338.84	-2.01	338.84
35	STINGER	-44.14	-12.95	.00	.00	.26	.02	.00	448.09	-431.84	.82	431.84
38	STINGER	-52.72	-16.11	.01	61.67	-6.34	.00	.00	443.24	-713.39	-9.53	713.45
41	STINGER	-61.82	-19.82	.01	20.54	16.28	.00	.00	438.81	-664.94	29.89	665.61
43	STINGER	-71.66	-24.29	.01	73.06	-22.93	.00	.00	433.12	-691.09	-116.19	700.79
45	STINGER	-74.48	-25.65	.02	.00	.00	.53	.01	432.00	-529.19	-94.28	537.52
47	SAGBEND	-85.28	-31.13	.10	.00	.00	.00	.00	425.98	-90.37	-32.35	95.98
48	SAGBEND	-96.12	-36.72	.20	.00	.00	.00	.00	418.98	157.37	1.26	157.38

49	SAGBEND	-107.02	-42.20	.31	.00	.00	.00	.00	411.97	300.24	18.16	300.79
50	SAGBEND	-118.03	-47.46	.41	.00	.00	.00	.00	405.26	386.32	25.59	387.17
51	SAGBEND	-129.18	-52.42	.48	.00	.00	.00	.00	398.96	441.12	27.98	442.00
52	SAGBEND	-140.46	-57.05	.53	.00	.00	.00	.00	393.11	478.20	27.80	479.01
53	SAGBEND	-151.90	-61.30	.56	.00	.00	.00	.00	387.75	504.79	26.37	505.48
54	SAGBEND	-163.48	-65.14	.56	.00	.00	.00	.00	382.91	524.57	24.38	525.14
55	SAGBEND	-175.19	-68.57	.55	.00	.00	.00	.00	378.60	539.21	22.13	539.66
56	SAGBEND	-187.01	-71.56	.51	.00	.00	.00	.00	374.86	549.04	19.71	549.40
57	SAGBEND	-198.95	-74.10	.46	.00	.00	.00	.00	371.69	553.34	16.99	553.60
58	SAGBEND	-210.97	-76.18	.40	.00	.00	.00	.00	369.11	550.10	13.66	550.27
59	SAGBEND	-223.06	-77.80	.32	.00	.00	.00	.00	367.13	535.53	9.05	535.60
60	SAGBEND	-235.20	-78.98	.23	.00	.00	.00	.00	365.76	502.86	2.03	502.87
61	SAGBEND	-247.38	-79.74	.15	.00	.00	.00	.00	364.99	440.28	-9.40	440.38
62	SAGBEND	-259.57	-80.13	.07	.16	-.16	.00	.00	364.75	327.12	-28.79	328.39
63	SEABED	-271.77	-80.25	.01	17.22	-7.00	.00	.00	364.87	132.04	-54.26	142.76
64	SEABED	-283.97	-80.25	.00	24.89	1.54	.00	.00	364.92	1.87	-16.38	16.49
65	SEABED	-296.17	-80.24	.00	16.61	1.48	.00	.00	364.91	-8.09	1.47	8.22
66	SEABED	-308.37	-80.24	.00	14.74	.07	.00	.00	364.91	-1.11	1.16	1.61
67	SEABED	-320.57	-80.24	.00	15.03	-.08	.00	.00	364.91	.37	.04	.38
68	SEABED	-332.77	-80.24	.00	15.19	-.01	.00	.00	364.91	.12	-.07	.13
69	SEABED	-344.97	-80.24	.00	15.19	.00	.00	.00	364.91	-.01	-.01	.01
70	SEABED	-357.17	-80.24	.00	15.18	.00	.00	.00	364.91	-.01	.00	.01
71	SEABED	-369.37	-80.24	.00	.00	.00	.00	.00	364.91	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.33	6.29	0.00	-0.001	1.581	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.29	5.96	0.00	-0.001	1.578	12.04	-0.0001	0.0000	-0.0136	-0.0001	0.0137	0.00
5	LAYBARGE	73.47	5.65	0.00	-0.001	1.751	22.87	-0.0002	0.0000	-0.0113	-0.0001	0.0114	0.00
7	TENSIONR	60.12	5.23	0.00	-0.001	1.780	36.22	0.0053	0.0000	-0.0038	0.0000	0.0090	0.00
9	LAYBARGE	57.10	5.14	0.00	-0.001	1.813	39.25	0.0053	0.0000	-0.0033	0.0000	0.0085	0.00
10	LAYBARGE	51.11	4.94	0.00	0.000	1.869	45.24	0.0053	0.0000	-0.0106	-0.0002	0.0158	0.00
11	LAYBARGE	46.46	4.79	0.00	0.000	2.055	49.89	0.0053	0.0000	-0.0317	-0.0003	0.0368	0.00
13	LAYBARGE	44.93	4.73	0.00	0.000	2.156	51.42	0.0053	0.0000	-0.0349	-0.0004	0.0401	0.00
14	TENSIONR	35.38	4.30	0.00	0.001	3.174	60.99	0.0103	0.0000	-0.0786	-0.0009	0.0882	0.00
16	LAYBARGE	23.36	3.42	0.00	0.000	5.417	73.04	0.0102	0.0000	-0.1331	-0.0014	0.1421	0.00
18	LAYBARGE	8.91	1.62	0.00	-0.002	8.850	87.61	0.0101	0.0000	-0.1651	0.0021	0.1747	0.00
20	LAYBARGE	3.13	0.61	0.00	0.000	10.543	93.47	0.0100	0.0000	-0.2893	0.0027	0.2988	0.00
24	STINGER	-7.62	-1.70	0.00	0.007	13.490	104.47	0.0099	-0.0002	-0.1525	-0.0022	0.1618	0.00
26	STINGER	-16.47	-3.98	0.00	0.005	15.652	113.62	0.0098	-0.0003	-0.1965	-0.0026	0.2051	0.00
29	STINGER	-26.07	-6.84	0.00	0.001	17.168	123.65	0.0097	-0.0006	-0.1116	-0.0017	0.1201	0.00
32	STINGER	-34.76	-9.67	0.01	-0.007	18.256	132.80	0.0096	-0.0008	-0.1264	-0.0019	0.1354	0.00
35	STINGER	-44.13	-12.89	0.01	-0.008	19.461	142.70	0.0094	-0.0010	-0.1693	-0.0020	0.1784	0.00
38	STINGER	-52.72	-16.03	0.01	-0.027	20.935	151.84	0.0092	-0.0013	-0.1666	-0.0036	0.1756	0.00
41	STINGER	-61.84	-19.74	0.01	0.013	23.043	161.65	0.0089	-0.0015	-0.1778	0.0134	0.1861	0.00
43	STINGER	-71.68	-24.18	0.01	-0.153	25.592	172.46	0.0086	-0.0019	-0.1581	-0.0440	0.1712	0.00
45	STINGER	-74.50	-25.55	0.02	-0.270	26.217	175.59	0.0085	-0.0020	-0.1259	-0.0366	0.1386	0.00
47	SAGBEND	-85.32	-31.03	0.10	-0.590	27.336	187.70	0.0081	-0.0024	-0.0435	-0.0163	0.0530	0.00
48	SAGBEND	-96.15	-36.62	0.21	-0.629	27.113	199.90	0.0077	-0.0029	0.0473	-0.0088	0.0553	0.00
49	SAGBEND	-107.04	-42.10	0.34	-0.585	26.103	212.10	0.0074	-0.0033	0.0676	0.0104	0.0761	0.00
50	SAGBEND	-118.04	-47.34	0.45	-0.515	24.740	224.30	0.0070	-0.0037	0.0822	0.0129	0.0910	0.00
51	SAGBEND	-129.20	-52.29	0.54	-0.375	23.159	236.50	0.0067	-0.0041	0.0925	0.0161	0.1012	0.00
52	SAGBEND	-140.49	-56.89	0.60	-0.222	21.401	248.70	0.0064	-0.0045	0.0979	0.0156	0.1063	0.00
53	SAGBEND	-151.94	-61.15	0.63	-0.099	19.492	260.90	0.0062	-0.0048	0.0999	0.0153	0.1089	0.00
54	SAGBEND	-163.51	-65.03	0.64	0.024	17.449	273.10	0.0059	-0.0051	0.1058	0.0124	0.1134	0.00
55	SAGBEND	-175.21	-68.50	0.60	0.111	15.362	285.30	0.0057	-0.0053	0.1076	0.0097	0.1149	0.00
56	SAGBEND	-187.02	-71.51	0.57	0.195	13.231	297.50	0.0055	-0.0056	0.1071	0.0099	0.1142	0.00
57	SAGBEND	-198.95	-74.07	0.53	0.298	11.058	309.70	0.0054	-0.0058	0.1080	0.0130	0.1161	0.00
58	SAGBEND	-210.97	-76.16	0.47	0.355	8.784	321.90	0.0052	-0.0059	0.1124	0.0157	0.1205	0.00
59	SAGBEND	-223.06	-77.79	0.38	0.386	6.621	334.10	0.0051	-0.0061	0.1136	0.0156	0.1212	0.00
60	SAGBEND	-235.20	-78.97	0.29	0.533	4.587	346.30	0.0051	-0.0062	0.1039	0.0119	0.1113	0.00
61	SAGBEND	-247.37	-79.71	0.19	0.509	2.646	358.50	0.0051	-0.0062	0.0864	-0.0077	0.0939	0.00
62	SAGBEND	-259.56	-80.09	0.10	0.418	1.145	370.70	0.0050	-0.0062	0.0646	-0.0161	0.0714	0.00
63	SEABED	-271.76	-80.24	0.03	0.230	0.348	382.90	0.0051	-0.0062	0.0377	-0.0190	0.0452	0.00
64	SEABED	-283.96	-80.28	0.00	0.073	0.018	395.10	0.0051	-0.0062	0.0149	-0.0104	0.0237	0.00
65	SEABED	-296.16	-80.27	0.00	-0.006	-0.047	407.30	0.0051	-0.0062	-0.0027	-0.0030	0.0118	0.00
66	SEABED	-308.36	-80.27	0.00	-0.008	-0.014	419.50	0.0051	-0.0062	-0.0016	0.0007	0.0110	0.00
67	SEABED	-320.56	-80.26	0.00	-0.003	-0.002	431.70	0.0052	-0.0062	-0.0007	0.0004	0.0103	0.00
68	SEABED	-332.76	-80.27	0.00	0.000	0.002	443.90	0.0052	-0.0062	-0.0002	0.0001	0.0100	0.00
69	SEABED	-344.96	-80.27	0.00	0.000	0.001	456.10	0.0052	-0.0062	0.0002	-0.0001	0.0100	0.00
70	SEABED	-357.16	-80.27	0.00	0.000	0.000	468.30	0.0053	-0.0062	0.0001	-0.0001	0.0100	0.00
71	SEABED	-369.36	-80.27	0.00	0.000	0.000	480.50	0.0053	-0.0062	0.0000	0.0000	0.0100	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT VERT (KN)	REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.33	6.29	0.00	16.98	0.11	0.00	0.00	0.00	4.69	-0.03	4.69
3	LAYBARGE	84.29	5.96	0.00	57.46	0.19	0.00	0.00	-6.40	-82.73	-0.50	82.73
5	LAYBARGE	73.47	5.65	0.00	51.13	-0.13	0.00	0.00	-12.22	-68.53	-0.36	68.53
7	TENSIONR	60.12	5.23	0.00	44.47	0.56	0.00	0.00	270.37	-22.94	-0.16	22.94
9	LAYBARGE	57.10	5.14	0.00	0.00	0.00	0.00	0.00	270.48	-20.07	-0.28	20.07
10	LAYBARGE	51.11	4.94	0.00	0.00	0.00	0.00	0.00	270.71	-64.39	-1.23	64.39
11	LAYBARGE	46.46	4.79	0.00	38.30	-0.54	0.00	0.00	270.79	-192.49	-1.62	192.49
13	LAYBARGE	44.93	4.73	0.00	0.00	0.00	0.00	0.00	270.82	-212.13	-2.21	212.13
14	TENSIONR	35.38	4.30	0.00	73.30	0.42	0.00	0.00	522.22	-477.13	-5.75	477.14
16	LAYBARGE	23.36	3.42	0.00	116.67	1.02	0.00	0.00	520.32	-808.22	-8.58	808.22
18	LAYBARGE	8.91	1.62	0.00	127.64	-3.57	0.02	0.00	515.36	-1001.83	12.48	1001.84
20	LAYBARGE	3.13	0.61	0.00	226.67	-8.55	0.06	0.00	510.76	-1500.50	15.69	1500.51
24	STINGER	-7.62	-1.70	0.00	106.87	-9.38	0.29	0.00	509.62	-925.54	-13.34	925.54
26	STINGER	-16.47	-3.98	0.00	172.02	-3.93	0.76	0.00	509.09	-1190.00	-15.93	1190.02
29	STINGER	-26.07	-6.84	0.00	136.34	-3.53	0.73	0.00	508.04	-677.50	-10.12	677.57
32	STINGER	-34.76	-9.67	0.01	277.47	-4.46	1.05	0.00	507.60	-767.02	-11.24	767.04
35	STINGER	-44.13	-12.89	0.01	280.64	-3.85	1.01	0.00	503.98	-1027.74	-12.19	1027.79
38	STINGER	-52.72	-16.03	0.01	159.50	-12.80	0.31	0.00	501.03	-1011.12	-21.57	1011.24
41	STINGER	-61.84	-19.74	0.01	133.33	40.72	0.02	0.00	494.20	-1078.96	81.21	1080.04
43	STINGER	-71.68	-24.18	0.01	113.89	-50.33	0.00	0.00	485.14	-959.39	-267.24	985.70
45	STINGER	-74.50	-25.55	0.02	0.00	0.00	0.55	0.02	483.29	-764.18	-222.01	790.28
47	SAGBEND	-85.32	-31.03	0.10	0.00	0.00	0.00	0.00	475.76	-263.86	-99.05	269.25
48	SAGBEND	-96.15	-36.62	0.21	0.00	0.00	0.00	0.00	468.08	287.22	-53.44	287.22
49	SAGBEND	-107.04	-42.10	0.34	0.00	0.00	0.00	0.00	460.50	410.14	63.02	410.14
50	SAGBEND	-118.04	-47.34	0.45	0.00	0.00	0.00	0.00	454.08	498.96	78.40	502.44
51	SAGBEND	-129.20	-52.29	0.54	0.00	0.00	0.00	0.00	448.74	561.54	97.68	564.96
52	SAGBEND	-140.49	-56.89	0.60	0.00	0.00	0.00	0.00	443.75	594.57	94.80	596.68
53	SAGBEND	-151.94	-61.15	0.63	0.00	0.00	0.00	0.00	439.06	606.70	92.78	612.03
54	SAGBEND	-163.51	-65.03	0.64	0.00	0.00	0.00	0.00	434.65	642.13	75.47	643.56
55	SAGBEND	-175.21	-68.50	0.60	0.00	0.00	0.00	0.00	430.59	653.22	58.90	653.60
56	SAGBEND	-187.02	-71.51	0.57	0.00	0.00	0.00	0.00	427.03	649.97	60.09	650.47
57	SAGBEND	-198.95	-74.07	0.53	0.00	0.00	0.00	0.00	424.11	655.80	79.20	657.69
58	SAGBEND	-210.97	-76.16	0.47	0.00	0.00	0.00	0.00	421.94	682.42	95.07	686.11
59	SAGBEND	-223.06	-77.79	0.38	0.00	0.00	0.00	0.00	420.55	689.40	94.64	691.83
60	SAGBEND	-235.20	-78.97	0.29	0.00	0.00	0.00	0.00	419.87	630.85	72.50	632.56
61	SAGBEND	-247.37	-79.71	0.19	0.09	-0.07	0.00	0.00	419.80	524.45	-46.52	524.83
62	SAGBEND	-259.56	-80.09	0.10	14.57	-9.73	0.00	0.00	420.20	392.42	-97.61	393.02
63	SEABED	-271.76	-80.24	0.03	28.81	-14.57	0.00	0.00	420.90	228.97	-115.44	229.48
64	SEABED	-283.96	-80.28	0.00	26.45	-6.49	0.00	0.00	421.93	90.74	-63.12	93.77
65	SEABED	-296.16	-80.27	0.00	20.63	2.97	0.00	0.00	423.72	-16.53	-18.07	18.57
66	SEABED	-308.36	-80.27	0.00	17.24	1.41	0.00	0.00	425.43	-9.98	4.49	10.00
67	SEABED	-320.56	-80.26	0.00	15.48	0.35	0.00	0.00	427.07	-4.20	2.62	4.22
68	SEABED	-332.76	-80.27	0.00	15.31	-0.15	0.00	0.00	428.65	-1.19	0.85	1.19
69	SEABED	-344.96	-80.27	0.00	15.38	-0.10	0.00	0.00	430.15	0.96	-0.38	0.97
70	SEABED	-357.16	-80.27	0.00	15.27	0.08	0.00	0.00	431.58	0.56	-0.37	0.56
71	SEABED	-369.36	-80.27	0.00	0.00	-0.02	0.00	0.00	432.94	0.00	0.00	0.00

Water Depth 80 m (180°)

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRESS (MPA)	HOOP STRESS (MPA)	BENDING STRESSES VERT (MPA)	BENDING STRESSES HORIZ (MPA)	TOTAL STRESS (MPA)	PERCNT YIELD (PCT)
1	LAYBARGE	96.31	6.28	.00	.000	1.576	.000	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	.000	1.573	12.038	-.06	.00	-26.33	.00	22.44	5.01
5	LAYBARGE	73.45	5.65	.00	.000	1.746	22.869	-.11	.00	-22.97	.00	19.63	4.38
7	TENSIONR	60.11	5.23	.00	.000	1.775	36.224	9.80	.00	-7.57	.00	16.24	3.62
9	LAYBARGE	57.08	5.14	.00	.000	1.808	39.248	9.79	.00	-6.65	.00	15.44	3.45
10	LAYBARGE	51.09	4.95	.00	.000	1.864	45.242	9.75	.00	-21.21	.00	27.78	6.20
11	LAYBARGE	46.45	4.79	.00	.000	2.049	49.890	9.72	.00	-64.46	.00	64.51	14.40
13	LAYBARGE	44.91	4.73	.00	.000	2.150	51.425	9.71	.00	-71.64	.00	70.60	15.76
14	TENSIONR	35.35	4.30	.00	.000	3.171	60.993	19.59	.00	-159.53	.00	155.19	34.64
16	LAYBARGE	23.34	3.42	.00	.000	5.423	73.039	19.41	.00	-255.08	.00	236.23	52.73
18	LAYBARGE	8.89	1.61	.00	.000	8.957	87.606	19.07	.00	-319.37	.00	290.54	64.85
20	LAYBARGE	3.11	.61	.00	.000	10.729	93.474	18.90	.00	-327.10	.00	296.94	66.28
24	STINGER	-7.60	-1.70	.00	.000	13.412	104.430	18.63	-.27	-213.89	.00	200.58	44.77
26	STINGER	-16.46	-3.96	.00	.000	15.254	113.574	18.33	-.64	-223.02	.00	208.22	46.48
29	STINGER	-26.10	-6.75	.00	.000	16.912	123.608	17.99	-1.08	-138.38	.00	136.15	30.39
32	STINGER	-34.82	-9.50	.00	.000	18.030	132.752	17.62	-1.53	-128.94	.00	127.99	28.57
35	STINGER	-44.20	-12.67	.00	.000	19.316	142.651	17.19	-2.03	-156.31	.00	151.08	33.72
38	STINGER	-52.79	-15.81	.00	.000	21.034	151.795	16.73	-2.54	-250.87	.00	231.25	51.62
41	STINGER	-61.88	-19.51	.00	.000	23.216	161.618	16.25	-3.13	-231.46	.00	214.57	47.90
43	STINGER	-71.73	-23.97	.00	.000	25.567	172.429	15.65	-3.85	-243.68	.00	224.73	50.16
45	STINGER	-74.56	-25.35	.00	.000	26.211	175.579	15.49	-4.07	-186.98	.00	176.49	39.40
47	SAGBEND	-85.36	-30.84	.00	.000	27.397	187.696	14.79	-4.95	-33.92	.00	46.29	10.33
48	SAGBEND	-96.19	-36.46	.00	.000	27.242	199.896	14.04	-5.85	52.40	.00	61.71	13.78
49	SAGBEND	-107.08	-41.96	.00	.000	26.320	212.095	13.29	-6.74	102.12	.00	103.63	23.13
50	SAGBEND	-118.08	-47.25	.00	.000	24.948	224.295	12.58	-7.59	132.01	.00	128.76	28.74
51	SAGBEND	-129.21	-52.23	.00	.000	23.298	236.495	11.91	-8.39	150.99	.00	144.63	32.28
52	SAGBEND	-140.49	-56.88	.00	.000	21.467	248.695	11.29	-9.13	163.79	.00	155.28	34.66
53	SAGBEND	-151.92	-61.15	.00	.000	19.511	260.896	10.71	-9.82	172.92	.00	162.83	36.35
54	SAGBEND	-163.49	-65.02	.00	.000	17.463	273.096	10.19	-10.44	179.68	.00	168.39	37.59
55	SAGBEND	-175.19	-68.47	.00	.000	15.348	285.296	9.73	-10.99	184.65	.00	172.45	38.49
56	SAGBEND	-187.01	-71.48	.00	.000	13.185	297.496	9.33	-11.48	187.97	.00	175.12	39.09
57	SAGBEND	-198.94	-74.03	.00	.000	10.993	309.696	8.99	-11.89	189.39	.00	176.21	39.33
58	SAGBEND	-210.96	-76.13	.00	.000	8.799	321.897	8.71	-12.22	188.25	.00	175.15	39.10
59	SAGBEND	-223.05	-77.77	.00	.000	6.639	334.097	8.49	-12.49	183.28	.00	170.86	38.14
60	SAGBEND	-235.19	-78.96	.00	.000	4.569	346.298	8.34	-12.68	172.20	.00	161.42	36.03
61	SAGBEND	-247.37	-79.72	.00	.000	2.681	358.499	8.24	-12.80	151.04	.00	143.45	32.02
62	SAGBEND	-259.56	-80.12	.00	.000	1.129	370.700	8.20	-12.86	112.85	.00	111.11	24.80
63	SEABED	-271.76	-80.25	.00	.000	.172	382.901	8.19	-12.88	46.79	.00	55.53	12.40
64	SEABED	-283.96	-80.25	.00	.000	-.045	395.102	8.20	-12.88	1.02	.00	19.11	4.26
65	SEABED	-296.16	-80.24	.00	.000	-.016	407.302	8.20	-12.88	-2.82	.00	20.36	4.55
66	SEABED	-308.36	-80.24	.00	.000	.001	419.502	8.20	-12.88	-.41	.00	18.68	4.17
67	SEABED	-320.56	-80.24	.00	.000	.001	431.702	8.20	-12.88	.13	.00	18.49	4.13
68	SEABED	-332.76	-80.24	.00	.000	.000	443.902	8.20	-12.88	.04	.00	18.43	4.11
69	SEABED	-344.96	-80.24	.00	.000	.000	456.102	8.20	-12.88	.00	.00	18.41	4.11
70	SEABED	-357.16	-80.24	.00	.000	.000	468.302	8.20	-12.88	.00	.00	18.41	4.11
71	SEABED	-369.36	-80.24	.00	.000	.000	480.502	8.20	-12.88	.00	.00	18.40	4.11

D Y N A M I C P I P E C O O R D I N A T E S, F O R C E S A N D S T R E S S E S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT REACTION VERT (KN)	SUPPORT REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.31	6.28	.00	16.58	.00	.00	.00	.00	.00	.00	.00
3	LAYBARGE	84.28	5.96	.00	56.46	.00	.00	.00	-1.36	-77.23	.00	77.23
5	LAYBARGE	73.45	5.65	.00	50.08	.00	.00	.00	-2.64	-67.36	.00	67.36
7	TENSIONR	60.11	5.23	.00	43.14	.00	.00	.00	240.92	-22.21	.00	22.21
9	LAYBARGE	57.08	5.14	.00	.00	.00	.00	.00	240.54	-19.50	.00	19.50
10	LAYBARGE	51.09	4.95	.00	.00	.00	.00	.00	239.75	-62.20	.00	62.20
11	LAYBARGE	46.45	4.79	.00	35.39	.00	.00	.00	239.00	-189.02	.00	189.02
13	LAYBARGE	44.91	4.73	.00	.00	.00	.00	.00	238.76	-210.07	.00	210.07
14	TENSIONR	35.35	4.30	.00	66.33	.00	.00	.00	481.61	-467.81	.00	467.81
16	LAYBARGE	23.34	3.42	.00	88.31	.00	.00	.00	477.05	-748.03	.00	748.03
18	LAYBARGE	8.89	1.61	.00	71.26	.00	.00	.00	468.84	-936.54	.00	936.54
20	LAYBARGE	3.11	.61	.00	75.76	.00	.00	.00	464.60	-959.22	.00	959.22
24	STINGER	-7.60	-1.70	.00	.00	.00	.01	.00	461.49	-627.24	.00	627.24
26	STINGER	-16.46	-3.96	.00	53.76	.00	.00	.00	458.58	-654.02	.00	654.02
29	STINGER	-26.10	-6.75	.00	.00	.00	.00	.00	455.85	-405.79	.00	405.79
32	STINGER	-34.82	-9.50	.00	9.20	.00	.00	.00	452.50	-378.12	.00	378.12
35	STINGER	-44.20	-12.67	.00	.00	.00	.02	.00	448.37	-458.38	.00	458.38
38	STINGER	-52.79	-15.81	.00	62.72	.00	.00	.00	443.52	-735.66	.00	735.66
41	STINGER	-61.88	-19.51	.00	19.36	.00	.00	.00	439.15	-678.75	.00	678.75
43	STINGER	-71.73	-23.97	.00	75.62	.00	.00	.00	433.45	-714.60	.00	714.60
45	STINGER	-74.56	-25.35	.00	.00	.00	.53	.00	432.34	-548.32	.00	548.32
47	SAGBEND	-85.36	-30.84	.00	.00	.00	.00	.00	426.33	-99.46	.00	99.46
48	SAGBEND	-96.19	-36.46	.00	.00	.00	.00	.00	419.31	153.67	.00	153.67

49	SAGBEND	-107.08	-41.96	.00	.00	.00	.00	.00	412.27	299.46	.00	299.46
50	SAGBEND	-118.08	-47.25	.00	.00	.00	.00	.00	405.53	387.13	.00	387.13
51	SAGBEND	-129.21	-52.23	.00	.00	.00	.00	.00	399.19	442.78	.00	442.78
52	SAGBEND	-140.49	-56.88	.00	.00	.00	.00	.00	393.31	480.31	.00	480.31
53	SAGBEND	-151.92	-61.15	.00	.00	.00	.00	.00	387.92	507.10	.00	507.10
54	SAGBEND	-163.49	-65.02	.00	.00	.00	.00	.00	383.05	526.92	.00	526.92
55	SAGBEND	-175.19	-68.47	.00	.00	.00	.00	.00	378.72	541.49	.00	541.49
56	SAGBEND	-187.01	-71.48	.00	.00	.00	.00	.00	374.95	551.22	.00	551.22
57	SAGBEND	-198.94	-74.03	.00	.00	.00	.00	.00	371.76	555.38	.00	555.38
58	SAGBEND	-210.96	-76.13	.00	.00	.00	.00	.00	369.16	552.04	.00	552.04
59	SAGBEND	-223.05	-77.77	.00	.00	.00	.00	.00	367.17	537.45	.00	537.45
60	SAGBEND	-235.19	-78.96	.00	.00	.00	.00	.00	365.78	504.97	.00	504.97
61	SAGBEND	-247.37	-79.72	.00	.00	.00	.00	.00	365.00	442.92	.00	442.92
62	SAGBEND	-259.56	-80.12	.00	.12	.00	.00	.00	364.75	330.93	.00	330.93
63	SEABED	-271.76	-80.25	.00	16.61	.00	.00	.00	364.86	137.20	.00	137.20
64	SEABED	-283.96	-80.25	.00	25.10	.00	.00	.00	364.92	3.01	.00	3.01
65	SEABED	-296.16	-80.24	.00	16.72	.00	.00	.00	364.91	-8.27	.00	8.27
66	SEABED	-308.36	-80.24	.00	14.74	.00	.00	.00	364.91	-1.20	.00	1.20
67	SEABED	-320.56	-80.24	.00	15.02	.00	.00	.00	364.91	.37	.00	.37
68	SEABED	-332.76	-80.24	.00	15.18	.00	.00	.00	364.91	.12	.00	.12
69	SEABED	-344.96	-80.24	.00	15.19	.00	.00	.00	364.91	-.01	.00	.01
70	SEABED	-357.16	-80.24	.00	15.18	.00	.00	.00	364.91	-.01	.00	.01
71	SEABED	-369.36	-80.24	.00	.00	.00	.00	.00	364.91	.00	.00	.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	HORIZ ANGLE (DEG)	VERT ANGLE (DEG)	PIPE LENGTH (M)	TENSILE STRAIN (PCT)	HOOP STRAIN (PCT)	BENDING STRAINS VERT (PCT)	BENDING STRAINS HORIZ (PCT)	TOTAL STRAIN (PCT)	PERCNT ALLOW (PCT)
1	LAYBARGE	96.32	6.28	0.00	0.000	1.575	0.00	0.0000	0.0000	0.0008	0.0000	0.0008	0.00
3	LAYBARGE	84.29	5.96	0.00	0.000	1.572	12.04	-0.0001	0.0000	-0.0136	0.0000	0.0137	0.00
5	LAYBARGE	73.46	5.65	0.00	0.000	1.745	22.87	-0.0002	0.0000	-0.0112	0.0000	0.0113	0.00
7	TENSIONR	60.12	5.23	0.00	0.000	1.774	36.22	0.0053	0.0000	-0.0037	0.0000	0.0090	0.00
9	LAYBARGE	57.09	5.14	0.00	0.000	1.807	39.25	0.0053	0.0000	-0.0033	0.0000	0.0085	0.00
10	LAYBARGE	51.10	4.95	0.00	0.000	1.863	45.24	0.0053	0.0000	-0.0108	0.0000	0.0158	0.00
11	LAYBARGE	46.46	4.79	0.00	0.000	2.048	49.89	0.0053	0.0000	-0.0320	0.0000	0.0369	0.00
13	LAYBARGE	44.92	4.73	0.00	0.000	2.149	51.42	0.0053	0.0000	-0.0351	0.0000	0.0401	0.00
14	TENSIONR	35.37	4.30	0.00	0.000	3.169	60.99	0.0103	0.0000	-0.0776	0.0000	0.0876	0.00
16	LAYBARGE	23.36	3.42	0.00	0.000	5.439	73.04	0.0103	0.0000	-0.1363	0.0000	0.1458	0.00
18	LAYBARGE	8.91	1.61	0.00	0.000	8.832	87.61	0.0102	0.0000	-0.1614	0.0000	0.1710	0.00
20	LAYBARGE	3.12	0.61	0.00	0.000	10.321	93.47	0.0101	0.0000	-0.2345	0.0000	0.2432	0.00
24	STINGER	-7.62	-1.59	0.00	0.000	13.038	104.46	0.0100	-0.0001	-0.1319	0.0000	0.1411	0.00
26	STINGER	-16.49	-3.78	0.00	0.000	15.015	113.60	0.0099	-0.0003	-0.1953	0.0000	0.2047	0.00
29	STINGER	-26.15	-6.55	0.00	0.000	16.603	123.64	0.0098	-0.0005	-0.1140	0.0000	0.1223	0.00
32	STINGER	-34.87	-9.30	0.00	0.000	17.846	132.78	0.0096	-0.0008	-0.1318	0.0000	0.1413	0.00
35	STINGER	-44.23	-12.44	0.00	0.000	19.103	142.69	0.0094	-0.0010	-0.1685	0.0000	0.1782	0.00
38	STINGER	-52.82	-15.60	0.00	0.000	20.809	151.83	0.0092	-0.0012	-0.1821	0.0000	0.1910	0.00
41	STINGER	-61.96	-19.30	0.00	0.000	23.015	161.65	0.0090	-0.0015	-0.1799	0.0002	0.1880	0.00
43	STINGER	-71.83	-23.74	0.00	0.000	25.634	172.46	0.0087	-0.0019	-0.1710	-0.0007	0.1800	0.00
45	STINGER	-74.65	-25.10	0.00	0.000	26.347	175.58	0.0086	-0.0020	-0.1366	-0.0006	0.1456	0.00
47	SAGBEND	-85.42	-30.58	0.00	-0.001	27.451	187.70	0.0082	-0.0024	-0.0445	-0.0003	0.0532	0.00
48	SAGBEND	-96.24	-36.20	0.00	-0.001	27.372	199.90	0.0079	-0.0028	0.0476	0.0002	0.0565	0.00
49	SAGBEND	-107.13	-41.71	0.00	0.000	26.448	212.10	0.0075	-0.0033	0.0715	-0.0003	0.0800	0.00
50	SAGBEND	-118.12	-46.99	0.00	0.000	25.033	224.30	0.0071	-0.0037	0.0851	0.0003	0.0928	0.00
51	SAGBEND	-129.26	-51.98	0.00	-0.001	23.378	236.50	0.0068	-0.0041	0.0940	-0.0003	0.1023	0.00
52	SAGBEND	-140.54	-56.63	0.00	0.000	21.515	248.70	0.0064	-0.0044	0.1004	0.0003	0.1082	0.00
53	SAGBEND	-151.97	-60.92	0.00	0.000	19.638	260.90	0.0061	-0.0048	0.1053	0.0004	0.1124	0.00
54	SAGBEND	-163.54	-64.79	0.00	0.000	17.632	273.10	0.0059	-0.0051	0.1079	0.0004	0.1149	0.00
55	SAGBEND	-175.23	-68.24	0.00	0.000	15.450	285.30	0.0056	-0.0053	0.1110	0.0003	0.1186	0.00
56	SAGBEND	-187.04	-71.27	0.00	0.002	13.353	297.50	0.0054	-0.0056	0.1093	0.0004	0.1162	0.00
57	SAGBEND	-198.96	-73.82	0.00	0.002	11.231	309.70	0.0053	-0.0058	0.1086	-0.0003	0.1154	0.00
58	SAGBEND	-210.97	-75.96	0.00	0.001	9.005	321.90	0.0051	-0.0059	0.1083	-0.0004	0.1153	0.00
59	SAGBEND	-223.06	-77.68	0.00	0.001	6.897	334.10	0.0050	-0.0061	0.1157	-0.0005	0.1226	0.00
60	SAGBEND	-235.19	-78.92	0.00	0.000	4.856	346.30	0.0050	-0.0062	0.1080	-0.0004	0.1148	0.00
61	SAGBEND	-247.36	-79.68	0.00	-0.001	2.762	358.50	0.0050	-0.0062	0.0912	0.0002	0.0976	0.00
62	SAGBEND	-259.55	-80.08	0.00	0.000	1.201	370.70	0.0050	-0.0062	0.0692	0.0003	0.0758	0.00
63	SEABED	-271.75	-80.24	0.00	0.001	0.386	382.90	0.0050	-0.0062	0.0399	-0.0004	0.0471	0.00
64	SEABED	-283.95	-80.28	0.00	0.001	0.028	395.10	0.0050	-0.0062	0.0168	-0.0003	0.0247	0.00
65	SEABED	-296.15	-80.27	0.00	0.000	-0.050	407.30	0.0051	-0.0062	-0.0029	-0.0001	0.0116	0.00
66	SEABED	-308.35	-80.27	0.00	0.000	-0.015	419.50	0.0051	-0.0062	-0.0018	0.0000	0.0110	0.00
67	SEABED	-320.55	-80.26	0.00	0.000	-0.001	431.70	0.0051	-0.0062	-0.0007	0.0000	0.0102	0.00
68	SEABED	-332.75	-80.27	0.00	0.000	0.002	443.90	0.0052	-0.0062	0.0003	0.0000	0.0100	0.00
69	SEABED	-344.95	-80.27	0.00	0.000	0.000	456.10	0.0052	-0.0062	0.0002	0.0000	0.0100	0.00
70	SEABED	-357.15	-80.27	0.00	0.000	0.000	468.30	0.0052	-0.0062	-0.0001	0.0000	0.0099	0.00
71	SEABED	-369.35	-80.27	0.00	0.000	0.000	480.50	0.0052	-0.0062	0.0000	0.0000	0.0099	0.00

M A X I M U M D Y N A M I C P I P E F O R C E S A N D S T R A I N S

NODE NO.	PIPE SECTION	X COORD (M)	Y COORD (M)	Z COORD (M)	SUPPORT VERT (KN)	REACTION HORIZ (KN)	SUPT SEPARATIONS VERT (M)	SUPT SEPARATIONS HORIZ (M)	PIPE TENSION (KN)	BENDING MOMENTS VERT (KN-M)	BENDING MOMENTS HORIZ (KN-M)	BENDING MOMENTS TOTAL (KN-M)
1	LAYBARGE	96.32	6.28	0.00	16.86	0.00	0.00	0.00	0.00	4.66	0.00	4.66
3	LAYBARGE	84.29	5.96	0.00	57.01	-0.01	0.00	0.00	-6.21	-82.68	0.01	82.68
5	LAYBARGE	73.46	5.65	0.00	50.52	-0.01	0.00	0.00	-11.84	-68.16	0.00	68.16
7	TENSIONR	60.12	5.23	0.00	43.52	-0.01	0.00	0.00	270.83	-22.58	0.00	22.58
9	LAYBARGE	57.09	5.14	0.00	0.00	0.00	0.00	0.00	271.11	-20.16	0.00	20.16
10	LAYBARGE	51.10	4.95	0.00	0.00	0.00	0.00	0.00	271.59	-65.75	0.02	65.75
11	LAYBARGE	46.46	4.79	0.00	38.62	-0.01	0.00	0.00	271.81	-194.15	0.02	194.15
13	LAYBARGE	44.92	4.73	0.00	0.00	0.00	0.00	0.00	271.88	-213.13	0.03	213.13
14	TENSIONR	35.37	4.30	0.00	68.85	0.00	0.00	0.00	523.79	-471.31	0.09	471.31
16	LAYBARGE	23.36	3.42	0.00	126.04	0.01	0.00	0.00	522.25	-827.56	0.13	827.56
18	LAYBARGE	8.91	1.61	0.00	130.88	0.01	0.01	0.00	517.57	-979.57	0.16	979.57
20	LAYBARGE	3.12	0.61	0.00	213.27	0.02	0.08	0.00	513.84	-1376.92	0.21	1376.92
24	STINGER	-7.62	-1.59	0.00	103.41	-0.02	0.24	0.00	514.24	-800.80	-0.17	800.80
26	STINGER	-16.49	-3.78	0.00	171.81	-0.03	0.62	0.00	513.99	-1183.07	-0.20	1183.07
29	STINGER	-26.15	-6.55	0.00	86.81	-0.02	0.60	0.00	511.50	-692.19	-0.13	692.19
32	STINGER	-34.87	-9.30	0.00	281.87	0.03	1.19	0.00	507.07	-799.77	0.13	799.77
35	STINGER	-44.23	-12.44	0.00	242.36	0.08	1.15	0.00	504.29	-1022.63	0.22	1022.63
38	STINGER	-52.82	-15.60	0.00	143.97	-0.19	0.35	0.00	500.22	-1104.58	-0.27	1104.58
41	STINGER	-61.96	-19.30	0.00	124.29	0.71	0.03	0.00	495.17	-1091.46	1.32	1091.46
43	STINGER	-71.83	-23.74	0.00	119.27	-0.81	0.00	0.00	488.48	-1037.96	-4.46	1037.96
45	STINGER	-74.65	-25.10	0.00	0.00	0.00	0.55	0.00	487.29	-829.22	-3.74	829.22
47	SAGBEND	-85.42	-30.58	0.00	0.00	0.00	0.00	0.00	480.78	-270.43	-1.58	270.43
48	SAGBEND	-96.24	-36.20	0.00	0.00	0.00	0.00	0.00	472.90	289.17	1.44	289.17
49	SAGBEND	-107.13	-41.71	0.00	0.00	0.00	0.00	0.00	464.81	433.82	-1.85	433.82
50	SAGBEND	-118.12	-46.99	0.00	0.00	0.00	0.00	0.00	456.95	516.67	2.09	516.67
51	SAGBEND	-129.26	-51.98	0.00	0.00	0.00	0.00	0.00	449.50	570.79	-2.10	570.79
52	SAGBEND	-140.54	-56.63	0.00	0.00	0.00	0.00	0.00	442.59	609.27	1.97	609.27
53	SAGBEND	-151.97	-60.92	0.00	0.00	0.00	0.00	0.00	436.16	639.10	2.15	639.10
54	SAGBEND	-163.54	-64.79	0.00	0.00	0.00	0.00	0.00	430.10	655.27	2.16	655.27
55	SAGBEND	-175.23	-68.24	0.00	0.00	0.00	0.00	0.00	424.40	673.64	1.90	673.64
56	SAGBEND	-187.04	-71.27	0.00	0.00	0.00	0.00	0.00	420.79	663.74	2.22	663.74
57	SAGBEND	-198.96	-73.82	0.00	0.00	0.00	0.00	0.00	418.04	658.99	-1.86	658.99
58	SAGBEND	-210.97	-75.96	0.00	0.00	0.00	0.00	0.00	416.16	657.68	-2.37	657.68
59	SAGBEND	-223.06	-77.68	0.00	0.00	0.00	0.00	0.00	415.02	702.22	-3.11	702.22
60	SAGBEND	-235.19	-78.92	0.00	0.00	0.00	0.00	0.00	414.71	655.75	-2.52	655.75
61	SAGBEND	-247.36	-79.68	0.00	0.06	-0.08	0.00	0.00	415.36	553.53	1.51	553.53
62	SAGBEND	-259.55	-80.08	0.00	13.98	0.34	0.00	0.00	416.84	420.17	1.89	420.17
63	SEABED	-271.75	-80.24	0.00	28.95	-0.40	0.00	0.00	418.61	241.92	-2.20	241.92
64	SEABED	-283.95	-80.28	0.00	27.77	-0.19	0.00	0.00	420.17	101.78	-1.54	101.78
65	SEABED	-296.15	-80.27	0.00	20.75	0.07	0.00	0.00	421.64	-17.54	-0.50	17.54
66	SEABED	-308.35	-80.27	0.00	17.38	0.03	0.00	0.00	423.05	-10.71	-0.13	10.71
67	SEABED	-320.55	-80.26	0.00	15.55	0.01	0.00	0.00	424.40	-4.36	0.08	4.36
68	SEABED	-332.75	-80.27	0.00	15.37	0.01	0.00	0.00	425.69	1.65	-0.04	1.65
69	SEABED	-344.95	-80.27	0.00	15.39	-0.01	0.00	0.00	426.92	1.18	-0.03	1.18
70	SEABED	-357.15	-80.27	0.00	15.30	0.01	0.00	0.00	428.10	-0.73	0.04	0.73
71	SEABED	-369.35	-80.27	0.00	0.00	0.00	0.00	0.00	429.21	0.00	0.00	0.00

LAMPIRAN D-1

HASIL PERHITUNGAN *LOCAL BUCKLING*

(*WATER DEPTH* = 109 M)

LOCAL BUCKLING CALCULATION

Water Depth 109 m (0°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	109	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	845.41	kN-m	OFFPIPE output
S_f	=	767.02	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	995.05	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	902.78	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	1.0960	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \ |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.664** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 109 m (45°)

Data				
OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	109	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)
Design Load Factor				
γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)
Bending Moment and Axial Force				
M_f	=	893.04	kN-m	OFFPIPE output
S_f	=	767.00	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	1051.11	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	902.76	kN	Persamaan (4.8) DNV OS-F101 (2013)
Parameter				
β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)
System Collapse Calculation				
p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	1.0960	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.738** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 109 m (90°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	109	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	845.23	kN-m	OFFPIPE output
S_f	=	767.05	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	994.84	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	902.82	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	1.0960	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check 0.664 ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 109 m (135°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	109	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	780.36	kN-m	OFFPIPE output
S_f	=	767.13	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	918.48	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	902.91	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	1.0960	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.570** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 109 m (180°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	109	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	736.22	kN-m	OFFPIPE output
S_f	=	756.69	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	866.53	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	890.62	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

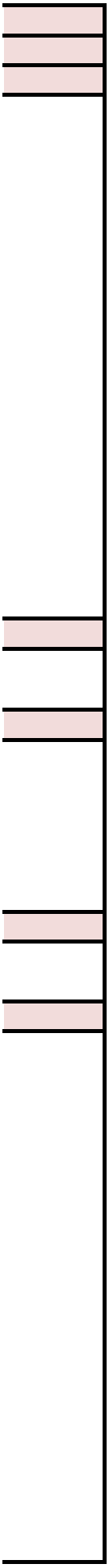
System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	1.0960	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.510** ≤ 1



LAMPIRAN D-2

HASIL PERHITUNGAN *LOCAL BUCKLING*

(*WATER DEPTH* = 101 M)

LOCAL BUCKLING CALCULATION

Water Depth 101 m (0°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	101	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	800.24	kN-m	OFFPIPE output
S_f	=	767.99	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	941.88	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	903.92	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	1.0156	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.596** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 101 m (45°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	101	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	777.52	kN-m	OFFPIPE output
S_f	=	767.46	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	915.14	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	903.30	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	1.0156	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.564** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 101 m (90°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	101	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	798.60	kN-m	OFFPIPE output
S_f	=	767.86	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	939.95	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	903.77	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	1.0156	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \ |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.593** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 101 m (135°)

Data				
OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	101	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)
Design Load Factor				
γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)
Bending Moment and Axial Force				
M_f	=	744.06	kN-m	OFFPIPE output
S_f	=	758.19	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	875.76	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	892.39	kN	Persamaan (4.8) DNV OS-F101 (2013)
Parameter				
β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)
System Collapse Calculation				
p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	1.0156	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \ |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.518** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 101 m (180°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	101	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	714.29	kN-m	OFFPIPE output
S_f	=	758.11	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	840.72	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	892.30	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	1.0156	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.479** ≤ 1

LAMPIRAN D-3

HASIL PERHITUNGAN *LOCAL BUCKLING*

(*WATER DEPTH* = 91 M)

LOCAL BUCKLING CALCULATION

Water Depth 91 m (0°)

Data			
OD =	0.508	m	
ID =	0.4762	m	
t =	0.0159	m	
E =	207000	MPa	
v =	0.3		
SMYS =	448	MPa	
SMTS =	530	MPa	
f_y, temp =	0	MPa	
f_u, temp =	0	MPa	
ρ_w =	1025	kg/m^3	
wd =	91	m	
f_o =	0.01		*ovality*
α_U =	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC} =	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m =	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab} =	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y =	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u =	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)
Design Load Factor			
γ_c =	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F =	1.1		Tabel 4-4 DNV OS-F101 (2013)
Bending Moment and Axial Force			
M_f =	840.98	kN-m	OFFPIPE output
S_f =	630.78	kN	OFFPIPE output
M_p =	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p =	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd} =	989.83	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd} =	742.43	kN	Persamaan (4.8) DNV OS-F101 (2013)
Parameter			
β =	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c =	1.0570		Persamaan (5.22) DNV OS-F101 (2013)
System Collapse Calculation			
p_{el} =	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p =	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b =	-13.9495	MPa	
c =	-796.4575	MPa^2	
d =	9488.7264	MPa^3	
u =	-287.1068	MPa^2	
v =	2792.1294	MPa^3	
Φ =	2.1821		
y =	6.8578	MPa	
p_c =	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e =	0.9150	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.646** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 91 m (45°)

Data				
OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	91	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)
Design Load Factor				
γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)
Bending Moment and Axial Force				
M_f	=	826.64	kN-m	OFFPIPE output
S_f	=	630.32	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	972.96	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	741.89	kN	Persamaan (4.8) DNV OS-F101 (2013)
Parameter				
β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)
System Collapse Calculation				
p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	0.9150	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.624** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 91 m (90°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	91	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	807.66	kN-m	OFFPIPE output
S_f	=	640.20	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	950.62	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	753.52	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	0.9150	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \leq 1 \qquad (5.28)$$

$$15 \leq D/t_2 \leq 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.597** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 91 m (135°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	91	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	724.10	kN-m	OFFPIPE output
S_f	=	630.41	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	852.27	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	741.99	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	0.9150	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.484** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 91 m (180°)

Data				
OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	91	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)
Design Load Factor				
γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)
Bending Moment and Axial Force				
M_f	=	772.09	kN-m	OFFPIPE output
S_f	=	630.84	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	908.75	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	742.50	kN	Persamaan (4.8) DNV OS-F101 (2013)
Parameter				
β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)
System Collapse Calculation				
p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	0.9150	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \leq 1 \qquad (5.28)$$

$$15 \leq D/t_2 \leq 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.547** ≤ 1

LAMPIRAN D-4

HASIL PERHITUNGAN *LOCAL BUCKLING*

(*WATER DEPTH* = 80 M)

LOCAL BUCKLING CALCULATION

Water Depth 80 m (0°)

Data				
OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	80	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)
Design Load Factor				
γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)
Bending Moment and Axial Force				
M_f	=	789.08	kN-m	OFFPIPE output
S_f	=	443.27	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	928.75	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	521.73	kN	Persamaan (4.8) DNV OS-F101 (2013)
Parameter				
β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)
System Collapse Calculation				
p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	0.8044	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.561** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 80 m (45°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	450	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	80	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	803.94	kN-m	OFFPIPE output
S_f	=	433.40	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	946.24	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	510.11	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	0.8044	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \leq 1 \qquad (5.28)$$

$$15 \leq D/t_2 \leq 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.582** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 80 m (90°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	80	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	821.77	kN-m	OFFPIPE output
S_f	=	443.55	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	967.22	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	522.06	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	0.8044	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \leq 1 \qquad (5.28)$$

$$15 \leq D/t_2 \leq 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.608** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 80 m (135°)

Data

OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	80	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)

Design Load Factor

γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)

Bending Moment and Axial Force

M_f	=	713.45	kN-m	OFFPIPE output
S_f	=	443.24	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	839.73	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	521.69	kN	Persamaan (4.8) DNV OS-F101 (2013)

Parameter

β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)

System Collapse Calculation

p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	0.8044	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{min}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.461** ≤ 1

LOCAL BUCKLING CALCULATION

Water Depth 80 m (180°)

Data				
OD	=	0.508	m	
ID	=	0.4762	m	
t	=	0.0159	m	
E	=	207000	MPa	
v	=	0.3		
SMYS	=	448	MPa	
SMTS	=	530	MPa	
f_y, temp	=	0	MPa	
f_u, temp	=	0	MPa	
ρ_w	=	1025	kg/m^3	
wd	=	80	m	
f_o	=	0.01		*ovality*
α_U	=	1		Tabel 5-4 DNV OS-F101 (2013)
γ_{SC}	=	1.26		Tabel 5-3 DNV OS-F101 (2013)
γ_m	=	1.15		Tabel 5-2 DNV OS-F101 (2013)
α_{fab}	=	0.93		Tabel 5-5 DNV OS-F101 (2013)
f_y	=	448	MPa	Persamaan (5.4) DNV OS-F101 (2013)
f_u	=	530	MPa	Persamaan (5.5) DNV OS-F101 (2013)
Design Load Factor				
γ_c	=	1.07		Tabel 4-5 DNV OS-F101 (2013)
γ_F	=	1.1		Tabel 4-4 DNV OS-F101 (2013)
Bending Moment and Axial Force				
M_f	=	735.66	kN-m	OFFPIPE output
S_f	=	443.52	kN	OFFPIPE output
M_p	=	1724.97	kN-m	Persamaan (5.21) DNV OS-F101 (2013)
S_p	=	11012.31	kN	Persamaan (5.20) DNV OS-F101 (2013)
M_{sd}	=	865.87	kN-m	Persamaan (4.6) DNV OS-F101 (2013)
S_{sd}	=	522.02	kN	Persamaan (4.8) DNV OS-F101 (2013)
Parameter				
β	=	0.3117		Persamaan (5.24) DNV OS-F101 (2013)
α_c	=	1.0570		Persamaan (5.22) DNV OS-F101 (2013)
System Collapse Calculation				
p_{el}	=	13.9495	MPa	Persamaan (13.11) DNV OS-F101 (2013)
p_p	=	26.0810	MPa	Persamaan (13.12) DNV OS-F101 (2013)
b	=	-13.9495	MPa	
c	=	-796.4575	MPa^2	
d	=	9488.7264	MPa^3	
u	=	-287.1068	MPa^2	
v	=	2792.1294	MPa^3	
Φ	=	2.1821		
y	=	6.8578	MPa	
p_c	=	11.5077	MPa	Persamaan (13.13) DNV OS-F101 (2013)
p_e	=	0.8044	MPa	$p_e = \rho_w \times wd \times g$

$$\left\{\gamma_m \cdot \gamma_{SC} \cdot \frac{|M_{Sd}|}{\alpha_c \cdot M_p(t_2)} + \left\{\frac{\gamma_m \cdot \gamma_{SC} \cdot S_{Sd}}{\alpha_c \cdot S_p(t_2)}\right\}^2\right\}^2 + \left(\gamma_m \cdot \gamma_{SC} \cdot \frac{p_e - p_{mn}}{p_c(t_2)}\right)^2 \le 1 \qquad (5.28)$$

$$15 \le D/t_2 \le 45, \quad P_i < P_e, \; |S_{Sd}|/S_p < 0.4$$

Local Buckling Check **0.490** ≤ 1

WATER DEPTH	CURRENT & WAVE DIRECTION	MAX. AXIAL TENSION	MAX. BENDING MOMENT	UNITY CHECK
(M)	(DEG)	(kN)	(kN-m)	
109	0	767.02	845.41	0.664
	45	767.00	893.04	0.738
	90	767.05	845.23	0.664
	135	767.13	780.36	0.570
	180	756.69	736.22	0.510
101	0	767.99	800.24	0.596
	45	767.46	777.52	0.564
	90	767.86	798.60	0.593
	135	758.19	744.06	0.518
	180	758.11	714.29	0.479
91	0	630.78	840.98	0.646
	45	630.32	826.64	0.624
	90	640.20	807.66	0.597
	135	630.41	724.10	0.484
	180	630.84	772.09	0.547
80	0	443.27	789.08	0.561
	45	433.40	803.94	0.582
	90	443.55	821.77	0.608
	135	443.24	713.45	0.461
	180	443.52	735.66	0.490

BIODATA PENULIS

Febrianti lahir di Jakarta pada 6 Februari 1995. Penulis merupakan anak pertama dari tiga bersaudara. Penulis mempunyai orang tua yang bernama Musian dan Mira Mulyati. Selain itu penulis mempunyai adik yang bernama Putri Hasana Fabilla dan Kannia Talitha. Selama ini penulis bertempat tinggal di jl. Pangrango No. 5 Guntur Jakarta Selatan. Pada jenjang kanak-kanak, penulis bersekolah di TK Tegal Jakarta Pusat. Kemudian penulis melanjutkan pendidikan jenjang sekolah dasar di SDNP Tebet Timur 15 Pagi Jakarta Selatan. Setelah itu, penulis melanjutkan jenang pendidikan menengah pertama dan atas di SMPN 115 Tebet Jakarta dan SMAN 26 Pagi Jakarta, penulis mengikuti ekstrakulikuler softball pada jenjang pendidikan menengah atas. Setelah lulus, penulis diterima di Jrusan Teknik Kelautan Institut Teknologi Sepuluh Nopember Surabaya. Penulis diterima melalui jalur Seleksi Nasional Masuk Perguruan Tinggi Negeri (SNMPTN) tahun 2013. Selama mahasiswa, penulis aktif dalam berbagai kepanitiaan dan organisasi mahasiswa. Pada tahun kedua, penulis terdaftar sebagai staff di Himpunan Mahasiswa Teknik Kelautan FTK ITS sebagai sekretaris Pengembangan Sumber Daya Mahasiswa (PSDM). Pada tahun ketiga, penulis menjadi kepala Divisi Pemetaan di bawah naungan PSDM Himpunan Mahasiswa Teknik Kelautan FTK ITS. Penulis pernah mengikuti Latihan Keterampilan Manajemen Mahasiswa Tingkat Pra-Dasar (LKMM Pra TD) dan Tingkat Dasar (LKMM TD). Penulis pernah menjalani kerja praktek kurang lebih selama dua bulan di Husky-CNOOC Madura Limited (HCML) pada tahun 2016. Pada tahun keempat, penulis mengambil tugas akhir dalam bidang perencanaan dan perancangan pipa bawah laut. Judul tugas akhir penulis adalah Analisis *Local Buckling* Pipa Bawah Laut 20 inch pada saat Instalasi dengan Metode S-Lay di Blok DA dan BH, Selat Madura. Selama pengerjaan tugas akhir tersebut, penulis dibimbing oleh Bapak Ir. Imam Rochani, M.Sc. dan Bapak Ir. J. J. Soedjono, M.Sc.