



MINISTÉRIO DOS TRANSPORTES
DEPARTAMENTO NACIONAL DE INFRA-ESTRUTURA DE TRANSPORTES

INSTRUÇÃO DE SERVIÇO Nº 04, DE 23 DE MARÇO DE 2010

O DIRETOR-GERAL DO DEPARTAMENTO NACIONAL DE INFRA-ESTRUTURA DE TRANSPORTES - DNIT, no uso das atribuições que lhe confere o art. 21, incisos IV e VI, da Estrutura Regimental aprovada pelo Decreto nº 5.675, de 27 de abril de 2006, após deliberação da Diretoria Colegiada e tendo em vista o contido no Processo nº 50600.001152/2010-19,

RESOLVE:

Art. 1º. Estabelecer critérios e procedimentos para o Programa de Defensas Metálicas nas Rodovias Federais sob jurisdição do DNIT - **PRODEFENSAS** que tem por objetivo a execução dos serviços de reabilitação, incluindo a substituição de peças inservíveis, manutenção, fornecimento e implantação de novos dispositivos de segurança tipo Defensas Metálicas na malha rodoviária federal pavimentada, contratados por meio de certame licitatório, transcorrido nos termos da Lei nº 8.666, de 21 de junho de 1993 e suas alterações posteriores, objeto do Edital de licitação número 159/2009.

DA FISCALIZAÇÃO E CONTROLE DE QUALIDADE

Art. 2º. Os Superintendentes Regionais do DNIT deverão designar os fiscais para o acompanhamento da execução de todos os serviços licitados, no âmbito da circunscrição da respectiva Superintendência, observadas as disposições do artigo 67 da Lei nº 8.666/1993.

Parágrafo Único. Os fiscais designados deverão acompanhar e comprovar a execução dos serviços contratados bem como o atendimento das Especificações e Normas Técnicas contidas no Termo de Referência do Edital nº 159/2009, e Anexos desta Instrução de Serviço.

DA EXECUÇÃO DOS SERVIÇOS

Art. 3º. A execução dos serviços deverá obedecer na íntegra ao disposto no Capítulo III – Termo de Referência do Edital, mais especificamente o item 4 – Projeto Básico e Plano de Trabalho que detalha os procedimentos para os levantamentos de campo, apresentação do Plano de Trabalho, Cronograma Físico-Financeiro, identificação das peças a serem implantadas (novas ou reabilitadas) e orientações complementares para execução dos serviços conforme o **Anexo I: Projetos Tipo para Defensas Metálicas – Disposições Gerais.**



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Parágrafo Primeiro. O início da execução dos serviços contratados ficará subordinado ao disposto no Parágrafo Quinto do Artigo 4º desta Instrução.

Parágrafo Segundo. As lâminas das defensas implantadas (novas ou reabilitadas) deverão ser identificadas por placas metálicas resistentes a intempéries fixadas nas lâminas por intermédio de adesivo, gravado ou por processo de pintura com os seguintes parâmetros:

- Identificação: _____ (Fabricante ou contratado)
- Lâmina: _____ (N= nova e R= reabilitada);
- Mês/Ano: ____/____.
- LOTE: _____

Parágrafo Terceiro. Na recolocação de postes para fixação das defensas deve-se primeiramente preencher o buraco remanescente com solo local para depois implantar o poste com equipamento adequado, de forma a assegurar as condições de fixação do sistema de contenção.

Parágrafo Quarto. Na transição entre sistema rígido (Barreira New Jersey, cabeceiras de pontes, viadutos) e o semimaleável devem ser considerados a implantação de postes adicionais para a correta transferência de esforços entre os diferentes sistemas.

Parágrafo Quinto. Os terminais dos módulos de defensas metálicas devem ter suas extremidades firmemente ancoradas devido ao esforço de tração que sofrem no momento do impacto. Quando fixados em sistema rígido os terminais devem ser acoplados com chapas e parafusos (ver figuras 16 e 18 do Anexo 1). Quando ancorados no solo devem ser finalizados com um poste totalmente enterrado para garantir a correta fixação.

Parágrafo Sexto. No sentido do tráfego, a guia de deslizamento anterior deve ficar sobreposta a posterior quando fixada ao poste. Esta providência deve ser rigorosamente observada para evitar que, em caso de choque, as lâminas possam funcionar como "lanças" perfurando os veículos.

DO PLANO DE TRABALHO

Art. 4º. A elaboração do Plano de Trabalho, conforme Anexo II – Plano de Trabalho, deverá obedecer ao disposto no item 4.3 do Termo de Referência do Edital em duas partes: Reabilitação e implantação de novas Defensas; e Relatório das necessidades futuras.

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Parágrafo Primeiro. A Reabilitação das Defensas existentes será executada conforme previsto no item 4.2.1 do Capítulo III – Termo de Referência do Edital;

Parágrafo Segundo. Os locais críticos, onde serão implantadas novas defensas, terminais atenuadores, terminais amortecedores e barreiras de aço, identificados, preliminarmente no levantamento de campo, seguirão as seguintes diretrizes:

- Defensas para separação de fluxos opostos em pista dupla;
- Defensas em situações de geometria desfavorável do segmento, tais como: curvas acentuadas, desníveis entre pistas e taludes com declividade superior a 1:3;
- Defensas em situações de obstáculos fixos: colunas de viadutos e passarelas, elementos de sinalização vertical, árvores, posteamentos e outros próximos a pista de rolamento;
- Histórico de acidentes do tipo saída de pista, choque com objeto fixo, queda de veículos com mortes e/ou feridos e outros, disponibilizados no sítio do DNIT (www.dnit.gov.br) e no Sistema Georreferenciado de Informações Viárias – SGV, disponibilizado pela Coordenação Geral de Operações Rodoviárias;
- Transições entre defensas e barreiras de concreto, em cabeceiras de pontes ou em outras situações, com enrijecimento variável através da diminuição contínua do espaçamento entre os postes (NBR 6971/1999) e possuir uma lâmina adicional para aumentar a rigidez proporcionando, desta forma, condições adequadas de segurança em caso de choque de veículo desgovernado;
- Adequação de início de defensas e barreiras de concreto, eliminando o risco de capotagem de veículos em sistemas com terminais enterrados, empregando um conjunto de início de tramo de defensas que faça de modo adequado e seguro, a ancoragem de entrada, para prover a contenção e o redirecionamento de veículos desgovernados, podendo ser:
 - Desviados,
 - Enterrados,
 - Ancorados em taludes de corte,
 - Terminais atenuadores de impacto retráteis, rediretivos desde o primeiro poste, ou
 - Terminais Amortecedores de impacto rediretivos.
- Barreiras de aço em aberturas operacionais, ou de emergência, em barreiras New Jersey em canteiro central, para eliminar o risco de impacto frontal na barreira de concreto.

Parágrafo Terceiro. O Plano de Trabalho, encaminhado via mídia digital em arquivo tipo PDF e desenhos impresso em folha formato A3, devendo apresentar na folha de rosto um espaço para anotação da DNIT e em dispositivo de mídia digital tais como: AutoCad

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com extensão DWG (AutoCad 2000 ou superior), MSVisio Draw, TrackMaker, CorelDraw e outros e cronograma de execução visando adequar os serviços aos recursos disponíveis em cada período considerado. A execução dos serviços deverá obedecer estritamente ao cronograma de execução supracitado.

Parágrafo Quarto. O Plano de Trabalho deverá manter a proporcionalidade inicial prevista no orçamento entre os serviços de recuperação e os serviços de implantação de novos sistemas de Defensas Metálicas.

Parágrafo Quinto. O Plano de Trabalho será validado pela Superintendência Regional do DNIT e aprovado pela Coordenação Geral de Operações Rodoviária – CGPERT, que comunicará aos interessados a autorização para início da execução dos serviços de acordo com o cronograma aprovado.

DAS MEDIÇÕES

Art. 5º Os procedimentos referentes às medições dos serviços do PRODEFENSA deverão obedecer às orientações contidas no Capítulo III – Termo de Referência contido no Edital nº 159/2009. A produção mensal de cada Unidade da Federação e Distrito Federal deverá ser enviada para a CGPERT que consolidará a execução dos serviços do(s) lote(s) do Programa. Toda a documentação referente ao Andamento Físico; Relatório Fotográfico; Atestado de Execução emitido pela Unidade Local - UL e Superintendência Regional; e Certificação da Qualidade dos Materiais empregados na execução dos serviços, deverá ser enviada no prazo máximo de 10 dias, impresso e meio digital.

Parágrafo Primeiro. A Contratada deverá encaminhar mensalmente Relatórios do Andamento Físico, preenchido conforme modelo do **Anexo III** – Quadro de Execução Física referente às atividades executadas e Certificação da Qualidade do Material utilizado, documentos obrigatórios do Processo Administrativo de Medição. Também devem ser enviados os Relatórios Fotográficos em meio digital, datado e registrando o status antes e depois dos serviços realizados conforme modelo do **Anexo IV** – Relatório Fotográfico.

Parágrafo Segundo. A Certificação da Qualidade do material utilizado, mencionada no item 13.6 alínea b do Edital, se fará da seguinte forma:

Caso o fornecedor e/ou fabricante não tenha certificação ISO para fabricação dos materiais do dispositivo de segurança Defesa Metálica, a comprovação da qualidade deverá ser feita através de Relatórios de Ensaio, em nome da licitante, de atendimento às especificações do Edital emitidos por laboratório(s) associados à ABIPT (Associação Brasileira de Institutos de Pesquisa Tecnológica) aptos a realizarem os seguintes ensaios:



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- Uniformidade da Camada de Zinco

A uniformidade da camada de zinco deve ser verificada pelo ensaio Preece, conforme NBR 7400/1990. A zincagem deve suportar um mínimo de 6 imersões para perfis de aço conformados e um mínimo de 4 imersões para parafusos, porcas e arruelas.

- Determinação da Massa do Revestimento

A zincagem deve proporcionar um revestimento mínimo de 350 g/m² verificado pelo ensaio de determinação da massa do revestimento por unidade de área conforme NBR 7397/2007.

- Ensaio de Tração

Os componentes das defensas devem ser de aço CF-24 ou equivalente, o método de ensaio deve ser conforme a NBR 6152/2002 e as propriedades mecânicas obedecer aos valores constantes da tabela 1 da NBR 6970/1999:

LR – Limite de Resistência à tração: mínimo 350 MPa

LE – Limite de escoamento: mínimo 240 MPa

LO – Alongamento: 23% (e > 3,0 mm)

- Ensaio de Dobramento

O método do ensaio deve ser de acordo com a NBR 6153/1988. O calço utilizado deve ser 1,5 vezes a espessura aplicada.

- Ensaio de Aderência do Revestimento

A aderência do revestimento deve ser verificada conforme NBR 7398/1991.

- Determinação da espessura do revestimento

A espessura do revestimento deve atender ao disposto no método de ensaio da NBR 7399/1990.

Parágrafo Terceiro. Para fornecedor e/ou fabricante com Certificação ISO em vigor é suficiente apresentar cópia autenticada da Certificação para comprovação da qualidade dos materiais.

Parágrafo Quarto. A fiscalização do DNIT deverá inspecionar visualmente as peças que compõe o lote. As peças galvanizadas devem possuir acabamento uniforme, livre de áreas não revestidas, sem manchas, bolhas e rugosidade que possam prejudicar a resistência do revestimento. Para o caso de alguma inconsistência identificada, a fiscalização poderá ordenar a Contratada o envio de uma amostra do lote para verificação de conformidade.

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DO ACOMPANHAMENTO DA EXECUÇÃO DOS SERVIÇOS

Art 6º. O Diário de Obras deverá ser preenchido conforme modelo constante do **Anexo V** – Diário de Obras, em atendimento à Norma DNIT 097/2007 – PRO que trata do assunto.

Art 7º. O Cronograma Físico poderá ser adequado trimestralmente pela Contratada. Tal proposição deverá ser aprovada pela Superintendência Regional do DNIT e encaminhada em mídia digital à CGPERT para homologação e acompanhamento da execução dos serviços do PRODEFENSAS.

CONSIDERAÇÕES FINAIS

Art. 8º. O reaproveitamento de elementos de defensas danificadas obedecerá às seguintes condições:

- a) galvanização por imersão a quente, de acordo com a NBR 6323/1990;
- b) formas, dimensões e tolerâncias previstas na NBR 6971/1999;
- c) vedada emendas de partes de elementos;
- d) peças com vincos (escoamento do aço) deverão ser descartadas;
- e) peças inservíveis deverão ser depositadas, mediante recibo, na UL do respectivo trecho.

Art. 9º. A orientação e a supervisão geral dos serviços ficarão a cargo da Coordenação Geral de Operações Rodoviárias - CGPERT.

LUIZ ANTONIO PAGOT
Diretor-Geral

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Rigaud
Ivone Santos Rigaud
Matr. DNIT nº 202-0

Anexo I:

Projetos Tipo para Defensas Metálicas – Disposições Gerais

1. Introdução

Este Anexo apresenta soluções padronizadas de Dispositivos de Contenção para os locais com situações de risco de acidentes com vítimas, considerando o histórico de acidentes no segmento, a inspeção em campo e a norma ABNT NBR 15.486/2007. Esta norma lista várias situações que devem ser tratadas para termos uma rodovia segura. O conceito básico é o da ZONA LIVRE, isto é, a existência de uma faixa, além da linha de borda da pista, sem obstáculos fixos ou taludes críticos. Desta forma, o condutor de um veículo desgovernado poderá ter condições de recuperar o controle antes de se chocar com uma árvore, antes de cair em um barranco íngreme ou de impactar com outra situação de risco dentro da área definida como ZONA LIVRE.

2. Zona Livre

O cálculo da Zona Livre é feito através do ábaco da Figura 1 da norma ABNT NBR 15.486/2007. Para a determinação da Zona Livre de uma determinada rodovia é necessário conhecer os seguintes valores: o VDM e a velocidade de projeto. De forma a criar valores padronizados em função dos parâmetros das rodovias federais, pode-se adotar os seguintes valores para a largura da Zona Livre:

LARGURA DA ZONA LIVRE (m) – situação tangente

VDM	Velocidade de Projeto (Km / h)		
	60	80	100
Até 6000	4,0	5,0	8,3
Maior que 6000	4,7	5,6	9,0

Em função das curvas horizontais, a largura da Zona Livre deverá ser aumentada em 20% do valor da tabela, para raios de curvatura menores de 800m, conforme tabela abaixo:

LARGURA DA ZONA LIVRE (m) – em curvas com raio menor que 800m

VDM	Velocidade de Projeto (Km / h)		
	60	80	100
Até 6000	4,8	6,0	10,0
Maior que 6000	5,6	6,7	10,8

3. Tipos de obstáculos fixos

Os obstáculos encontrados nas rodovias representam riscos de acidentes. Estes obstáculos deverão ser tratados de forma a eliminar o risco aos usuários da rodovia. São os seguintes elementos e situações que podem ser considerados como obstáculos:

- Árvore ($\varnothing \geq 15$ cm)
- Poste de iluminação
- Coluna de pórtico, semi-pórtico ou PMV
- Pilar de ponte ou passarela
- Telefone de socorro
- Abrigo para ponto de ônibus
- Suporte de placa de sinalização
- Obras de Arte Corrente

- Elementos de concreto (caixas de drenagem, fundações não utilizadas)
- Pedras e matacões
- Talude crítico
- Bifurcações

Para as situações acima listadas, deverá ser empregada uma das opções abaixo listadas, na seguinte ordem:

- Remover o obstáculo
- Afastar o obstáculo da área da Zona Livre
- Proteger do perigo, representado pelo obstáculo, empregando um dispositivo de contenção lateral, ou com um dispositivo amortecedor de impacto.

4. Emprego de dispositivos de contenção em situações de obstáculos fixos

Quando não for possível efetuar a remoção ou o afastamento do obstáculo para fora da Zona Livre calculada, deverá ser implantada uma linha de defesa metálica, para proteger do risco de impacto.

4.1 Cálculo do comprimento necessário para obstáculo isolado (uma árvore, um bloco de fundação, etc)

Os postes e as árvores com afastamento entre si maior que 40m, medido ao longo da pista, são considerados como obstáculos fixos isolados. Para a determinação do comprimento necessário de defensas é necessário calcular geometricamente a extensão do dispositivo de forma que intercepte a trajetória do veículo desgovernado, considerando um ângulo de impacto de no máximo 15°, de forma que o veículo não atinja o obstáculo, conforme figuras abaixo (desenhos no final do texto):

Figura 01: Esquema de Defensas e Terminais para Pista Simples

Figura 02: Esquema de Defensas e Terminais para Pista Dupla

4.2 Cálculo do comprimento necessário para múltiplos obstáculos (duas ou mais árvores, linha contínua de postes, etc)

São considerados obstáculos múltiplos aqueles que, ao longo da pista, tenham distância, entre si, menor que 40m. Para a determinação do comprimento necessário de defensas é necessário calcular geometricamente a extensão do dispositivo de forma que intercepte a trajetória do veículo desgovernado, considerando um ângulo de impacto de no máximo 15°, de forma que o veículo não atinja o obstáculo, incluindo toda a extensão da linha de obstáculos, conforme figuras abaixo (desenhos no final do texto):

Figura 3A: Obstáculos Múltiplos Terminal Desviado – Pista Dupla

Figura 3B: Obstáculos Múltiplos Amortecedor Retrátil – Pista Dupla

Figura 4A: Obstáculos Múltiplos Terminal Desviado – Pista Simples

Figura 4B: Obstáculos Múltiplos Amortecedor Retrátil – Pista Simples

5. Tratamentos especiais

5.1 Início de tramo de defensas

Opções para início de tramo de defensas:

Terminais de Entrada: Conjunto de início de tramo de defensas que faz de modo adequado e seguro, a ancoragem de entrada, que seja capaz de desenvolver a tensão total da lâmina para prover a contenção e o redirecionamento de veículos desgovernados, podendo ser terminais enterrados (para velocidades das vias inferiores a 60 km/h), desviados, ancorados em taludes de corte, ou terminais absorvedores de energia.

Terminal enterrado: Conjunto composto por 4 módulos de defesa, variando na altura desde a posição de projeto até a extremidade totalmente enterrada, que deve ser firmemente fixada ao solo, através de peça apropriada. **É vedado o seu uso em locais com velocidade de projeto superior a 60 km/h.** Deve ser implantado de acordo com a figura em anexo:

Figura 05: Terminal Enterrado

Terminal desviado: Tipo de terminal abatido defletido horizontalmente de forma a que a variação de altura da lâmina se inicie fora da zona livre, calculada conforme a NBR 15486. Nesta situação, a deflexão horizontal permitida (a partir da borda do acostamento) é de 4:1

Figura 06: Terminal Desviado

Terminal ancorado em talude de corte: Conjunto onde as defensas são defletidas horizontalmente prosseguindo até o talude de corte onde deve ser firmemente ancorada.

Figura 07: Terminal Ancorado em talude de corte

Amortecedor retrátil: Consiste em um cabeçal de impacto acoplado a um sistema de lâminas de defesa, adequadamente ancorado, que ao serem impactados frontalmente absorvem a energia cinética do veículo impactante, conduzindo-o a uma parada segura. O amortecedor retrátil, tratado na NBR 15.486 como terminal absorvedor, deverá ser implantado quando:

- Não for possível empregar o terminal ancorado em talude de corte
- Não existir espaço para o emprego do terminal desviado, quer seja por canteiro estreito ou por existir um talude crítico de aterro.

Figura 08: Amortecedor Retrátil

5.2 Obstáculos em bifurcações

Os obstáculos, como, por exemplo, coluna(s) para placa de sinalização, em situações de bifurcação (saída de pista) deverão ser tratados com a implantação de Amortecedores de Impacto.

Figura 09: Obstáculos em Bifurcações

5.3 Início de Barreira em canteiro central (ou lateral)

O início de barreiras ou defensas em canteiro central apresenta riscos aos usuários, nas rodovias com velocidade de projeto maior que 60 Km/h. Nestes casos o sistema de contenção (defensa ou barreira) deverá ser tratado com a implantação de Amortecedor de Impacto.

Figura 10: Barreira em Canteiro Central

Figura 11: Barreira na Lateral da Pista

5.4 Taludes em aterro

Os aterros com mais de um metro de altura e com talude com declividade maior que 1:3, deverão ser tratados com defensas, em toda a extensão do talude crítico, conforme item 4.2.1.1.1 da NBR 15.486.

5.5 Cabeceiras de pontes e conexão entre defensas e barreiras

Nas cabeceiras de pontes (entrada e saída) deverão ser implantadas defensas metálicas de forma a impedir a queda do veículo. Na inexistência de obstáculos fixos ou taludes críticos na proximidade da ponte, deverão ser implantadas defensas com os comprimentos mínimos conforme desenhos (ver Figuras 12 a 18 no final do texto). No caso da existência de obstáculos fixos ou taludes críticos na proximidade da ponte, as defensas deverão ter a extensão aumentada, de forma a abranger estes perigos. No caso em que a ponte, ao invés de ter uma barreira de concreto, tenha um gradil de concreto ou barras de aço, a defesa deverá ser implantada em todo o comprimento da ponte, empregando colunas flangeadas.

6. Tabelas de comprimento de tramo de defensas em situações de obstáculos fixos

As defensas devem ser instaladas a uma distância mínima de 1,0m da borda da faixa de rolamento da rodovia. Nos casos em que a crista do talude de aterro esteja a menos de 1,5m da borda da faixa de rolamento, a distância poderá ser diminuída para 0,5m. Neste caso, tendo pouco solo atrás dos postes da defesa, o espaçamento entre postes deverá ser reduzido para 2m e o comprimento do poste deverá ser aumentado para 2,5m.

Considerando que o cálculo para o comprimento do Terminal Desviado (TD) é dado pela equação:

$$TD = (ZL - A) \times 4 + 8; \text{ sendo}$$

ZL a largura da Zona Livre

A a distância entre a defesa e a faixa de borda da pista de rolamento.

Para as situações comuns de refúgio e acostamento, são considerados os seguintes valores:

- Refúgio A = 1,0m
- Acostamento A = 2,5m

Considerando que a Ancoragem de Saída (AS) pode ser executada com 8m, devem ser empregados os esquemas de defensas, conforme as figuras 1 e 2, e as tabelas I (Refúgio) e II (Acostamento).

Tabela I – Refúgio com 1,0m.

ZL = 4,0m	Comprimentos (m)			TOTAL do tramo de defesa (m)		
	Afastamento X (m)	TD	Corpo	AS	com TD	com TR
	2,0	20,0	4,0	8,0	32,0	12,0
	2,1	20,0	8,0	8,0	36,0	16,0
	2,2	20,0	8,0	8,0	36,0	16,0
	2,3	20,0	8,0	8,0	36,0	16,0
	2,4	20,0	8,0	8,0	36,0	16,0
	2,5	20,0	8,0	8,0	36,0	16,0
	2,6	20,0	8,0	8,0	36,0	16,0
	2,7	20,0	8,0	8,0	36,0	16,0
	2,8	20,0	8,0	8,0	36,0	16,0
	2,9	20,0	8,0	8,0	36,0	16,0
	3,0	20,0	8,0	8,0	36,0	16,0
	3,1	20,0	8,0	8,0	36,0	16,0
	3,2	20,0	12,0	8,0	40,0	20,0
	3,3	20,0	12,0	8,0	40,0	20,0
	3,4	20,0	12,0	8,0	40,0	20,0
	3,5	20,0	12,0	8,0	40,0	20,0
	3,6	20,0	12,0	8,0	40,0	20,0
	3,7	20,0	12,0	8,0	40,0	20,0
	3,8	20,0	12,0	8,0	40,0	20,0
	3,9	20,0	12,0	8,0	40,0	20,0
	4,0	20,0	12,0	8,0	40,0	20,0

Tabela I – Refúgio com 1,0m.

ZL = 4,7m e 5,0m	Comprimentos (m)			TOTAL do tramo de defensa (m)	
	Afastamento X (m)	TD	Corpo	AS	com TD
2,0	24,0	4,0	8,0	36,0	12,0
2,1	24,0	8,0	8,0	40,0	16,0
2,2	24,0	8,0	8,0	40,0	16,0
2,3	24,0	8,0	8,0	40,0	16,0
2,4	24,0	8,0	8,0	40,0	16,0
2,5	24,0	8,0	8,0	40,0	16,0
2,6	24,0	8,0	8,0	40,0	16,0
2,7	24,0	8,0	8,0	40,0	16,0
2,8	24,0	8,0	8,0	40,0	16,0
2,9	24,0	8,0	8,0	40,0	16,0
3,0	24,0	8,0	8,0	40,0	16,0
3,1	24,0	8,0	8,0	40,0	16,0
3,2	24,0	12,0	8,0	44,0	20,0
3,3	24,0	12,0	8,0	44,0	20,0
3,4	24,0	12,0	8,0	44,0	20,0
3,5	24,0	12,0	8,0	44,0	20,0
3,6	24,0	12,0	8,0	44,0	20,0
3,7	24,0	12,0	8,0	44,0	20,0
3,8	24,0	12,0	8,0	44,0	20,0
3,9	24,0	12,0	8,0	44,0	20,0
4,0	24,0	12,0	8,0	44,0	20,0
4,1	24,0	12,0	8,0	44,0	20,0
4,2	24,0	12,0	8,0	44,0	20,0
4,3	24,0	16,0	8,0	48,0	24,0
4,4	24,0	16,0	8,0	48,0	24,0
4,5	24,0	16,0	8,0	48,0	24,0
4,6	24,0	16,0	8,0	48,0	24,0
4,7	24,0	16,0	8,0	48,0	24,0
4,8	24,0	16,0	8,0	48,0	24,0
4,9	24,0	16,0	8,0	48,0	24,0
5,0	24,0	16,0	8,0	48,0	24,0

Tabela I – Refúgio com 1,0m.

ZL = 5,6 m e 6,0m	Comprimentos (m)			TOTAL do tramo de defensa (m)	
	Afastamento X (m)	TD	Corpo	AS	com TD
2,0	28,0	4,0	8,0	40,0	12,0
2,1	28,0	8,0	8,0	44,0	16,0
2,2	28,0	8,0	8,0	44,0	16,0
2,3	28,0	8,0	8,0	44,0	16,0
2,4	28,0	8,0	8,0	44,0	16,0
2,5	28,0	8,0	8,0	44,0	16,0
2,6	28,0	8,0	8,0	44,0	16,0
2,7	28,0	8,0	8,0	44,0	16,0
2,8	28,0	8,0	8,0	44,0	16,0
2,9	28,0	8,0	8,0	44,0	16,0
3,0	28,0	8,0	8,0	44,0	16,0
3,1	28,0	8,0	8,0	44,0	16,0
3,2	28,0	12,0	8,0	48,0	20,0
3,3	28,0	12,0	8,0	48,0	20,0
3,4	28,0	12,0	8,0	48,0	20,0
3,5	28,0	12,0	8,0	48,0	20,0
3,6	28,0	12,0	8,0	48,0	20,0
3,7	28,0	12,0	8,0	48,0	20,0
3,8	28,0	12,0	8,0	48,0	20,0
3,9	28,0	12,0	8,0	48,0	20,0
4,0	28,0	12,0	8,0	48,0	20,0
4,1	28,0	12,0	8,0	48,0	20,0
4,2	28,0	12,0	8,0	48,0	20,0
4,3	28,0	16,0	8,0	52,0	24,0
4,4	28,0	16,0	8,0	52,0	24,0
4,5	28,0	16,0	8,0	52,0	24,0
4,6	28,0	16,0	8,0	52,0	24,0
4,7	28,0	16,0	8,0	52,0	24,0
4,8	28,0	16,0	8,0	52,0	24,0
4,9	28,0	16,0	8,0	52,0	24,0
5,0	28,0	16,0	8,0	52,0	24,0
5,1	28,0	16,0	8,0	52,0	24,0
5,2	28,0	16,0	8,0	52,0	24,0
5,3	28,0	16,0	8,0	52,0	24,0
5,4	28,0	20,0	8,0	56,0	28,0
5,5	28,0	20,0	8,0	56,0	28,0
5,6	28,0	20,0	8,0	56,0	28,0
5,7	28,0	20,0	8,0	56,0	28,0
5,8	28,0	20,0	8,0	56,0	28,0
5,9	28,0	20,0	8,0	56,0	28,0
6,0	28,0	20,0	8,0	56,0	28,0

Tabela I – Refúgio com 1,0m.

ZL = 6,7m	Comprimentos (m)			TOTAL do tramo de defesa (m)	
	Afastamento X (m)	TD	Corpo	AS	com TD
2,0	32,0	4,0	8,0	44,0	12,0
2,1	32,0	8,0	8,0	48,0	16,0
2,2	32,0	8,0	8,0	48,0	16,0
2,3	32,0	8,0	8,0	48,0	16,0
2,4	32,0	8,0	8,0	48,0	16,0
2,5	32,0	8,0	8,0	48,0	16,0
2,6	32,0	8,0	8,0	48,0	16,0
2,7	32,0	8,0	8,0	48,0	16,0
2,8	32,0	8,0	8,0	48,0	16,0
2,9	32,0	8,0	8,0	48,0	16,0
3,0	32,0	8,0	8,0	48,0	16,0
3,1	32,0	8,0	8,0	48,0	16,0
3,2	32,0	12,0	8,0	52,0	20,0
3,3	32,0	12,0	8,0	52,0	20,0
3,4	32,0	12,0	8,0	52,0	20,0
3,5	32,0	12,0	8,0	52,0	20,0
3,6	32,0	12,0	8,0	52,0	20,0
3,7	32,0	12,0	8,0	52,0	20,0
3,8	32,0	12,0	8,0	52,0	20,0
3,9	32,0	12,0	8,0	52,0	20,0
4,0	32,0	12,0	8,0	52,0	20,0
4,1	32,0	12,0	8,0	52,0	20,0
4,2	32,0	12,0	8,0	52,0	20,0
4,3	32,0	16,0	8,0	56,0	24,0
4,4	32,0	16,0	8,0	56,0	24,0
4,5	32,0	16,0	8,0	56,0	24,0
4,6	32,0	16,0	8,0	56,0	24,0
4,7	32,0	16,0	8,0	56,0	24,0
4,8	32,0	16,0	8,0	56,0	24,0
4,9	32,0	16,0	8,0	56,0	24,0
5,0	32,0	16,0	8,0	56,0	24,0
5,1	32,0	16,0	8,0	56,0	24,0
5,2	32,0	16,0	8,0	56,0	24,0
5,3	32,0	20,0	8,0	60,0	28,0
5,4	32,0	20,0	8,0	60,0	28,0
5,5	32,0	20,0	8,0	60,0	28,0
5,6	32,0	20,0	8,0	60,0	28,0
5,7	32,0	20,0	8,0	60,0	28,0
5,8	32,0	20,0	8,0	60,0	28,0
5,9	32,0	20,0	8,0	60,0	28,0
6,0	32,0	20,0	8,0	60,0	28,0
6,1	32,0	20,0	8,0	60,0	28,0
6,2	32,0	20,0	8,0	60,0	28,0
6,3	32,0	20,0	8,0	60,0	28,0
6,4	32,0	24,0	8,0	64,0	32,0
6,5	32,0	24,0	8,0	64,0	32,0
6,6	32,0	24,0	8,0	64,0	32,0
6,7	32,0	24,0	8,0	64,0	32,0

Tabela I – Refúgio com 1,0m.

ZL = 8,3m e 9,0m	Comprimentos (m)			TOTAL do tramo de defensa (m)	
	Afastamento X (m)	TD	Corpo	AS	com TD
2,0	40,0	4,0	8,0	52,0	12,0
2,1	40,0	8,0	8,0	56,0	16,0
2,2	40,0	8,0	8,0	56,0	16,0
2,3	40,0	8,0	8,0	56,0	16,0
2,4	40,0	8,0	8,0	56,0	16,0
2,5	40,0	8,0	8,0	56,0	16,0
2,6	40,0	8,0	8,0	56,0	16,0
2,7	40,0	8,0	8,0	56,0	16,0
2,8	40,0	8,0	8,0	56,0	16,0
2,9	40,0	8,0	8,0	56,0	16,0
3,0	40,0	8,0	8,0	56,0	16,0
3,1	40,0	8,0	8,0	56,0	16,0
3,2	40,0	12,0	8,0	60,0	20,0
3,3	40,0	12,0	8,0	60,0	20,0
3,4	40,0	12,0	8,0	60,0	20,0
3,5	40,0	12,0	8,0	60,0	20,0
3,6	40,0	12,0	8,0	60,0	20,0
3,7	40,0	12,0	8,0	60,0	20,0
3,8	40,0	12,0	8,0	60,0	20,0
3,9	40,0	12,0	8,0	60,0	20,0
4,0	40,0	12,0	8,0	60,0	20,0
4,1	40,0	12,0	8,0	60,0	20,0
4,2	40,0	12,0	8,0	60,0	20,0
4,3	40,0	16,0	8,0	64,0	24,0
4,4	40,0	16,0	8,0	64,0	24,0
4,5	40,0	16,0	8,0	64,0	24,0
4,6	40,0	16,0	8,0	64,0	24,0
4,7	40,0	16,0	8,0	64,0	24,0
4,8	40,0	16,0	8,0	64,0	24,0
4,9	40,0	16,0	8,0	64,0	24,0
5,0	40,0	16,0	8,0	64,0	24,0
5,1	40,0	16,0	8,0	64,0	24,0
5,2	40,0	16,0	8,0	64,0	24,0
5,3	40,0	16,0	8,0	64,0	24,0
5,4	40,0	20,0	8,0	68,0	28,0
5,5	40,0	20,0	8,0	68,0	28,0
5,6	40,0	20,0	8,0	68,0	28,0
5,7	40,0	20,0	8,0	68,0	28,0
5,8	40,0	20,0	8,0	68,0	28,0

5,9	40,0	20,0	8,0	68,0	28,0
6,0	40,0	20,0	8,0	68,0	28,0
6,1	40,0	20,0	8,0	68,0	28,0
6,2	40,0	20,0	8,0	68,0	28,0
6,3	40,0	20,0	8,0	68,0	28,0
6,4	40,0	24,0	8,0	72,0	32,0
6,5	40,0	24,0	8,0	72,0	32,0
6,6	40,0	24,0	8,0	72,0	32,0
6,7	40,0	24,0	8,0	72,0	32,0
6,8	40,0	24,0	8,0	72,0	32,0
6,9	40,0	24,0	8,0	72,0	32,0
7,0	40,0	24,0	8,0	72,0	32,0
7,1	40,0	24,0	8,0	72,0	32,0
7,2	40,0	24,0	8,0	72,0	32,0
7,3	40,0	24,0	8,0	72,0	32,0
7,4	40,0	24,0	8,0	72,0	32,0
7,5	40,0	28,0	8,0	76,0	36,0
7,6	40,0	28,0	8,0	76,0	36,0
7,7	40,0	28,0	8,0	76,0	36,0
7,8	40,0	28,0	8,0	76,0	36,0
7,9	40,0	28,0	8,0	76,0	36,0
8,0	40,0	28,0	8,0	76,0	36,0
8,1	40,0	28,0	8,0	76,0	36,0
8,2	40,0	28,0	8,0	76,0	36,0
8,3	40,0	28,0	8,0	76,0	36,0
8,4	40,0	28,0	8,0	76,0	36,0
8,5	40,0	28,0	8,0	76,0	36,0
8,6	40,0	32,0	8,0	80,0	40,0
8,7	40,0	32,0	8,0	80,0	40,0
8,8	40,0	32,0	8,0	80,0	40,0
8,9	40,0	32,0	8,0	80,0	40,0
9,0	40,0	32,0	8,0	80,0	40,0

Tabela I – Refúgio com 1,0m.

ZL = 10,0m	Comprimentos (m)			TOTAL do tramo de defesa (m)	
	Afastamento X (m)	TD	Corpo	AS	com TD
2,0	44,0	4,0	8,0	56,0	12,0
2,1	44,0	8,0	8,0	60,0	16,0
2,2	44,0	8,0	8,0	60,0	16,0
2,3	44,0	8,0	8,0	60,0	16,0
2,4	44,0	8,0	8,0	60,0	16,0
2,5	44,0	8,0	8,0	60,0	16,0
2,6	44,0	8,0	8,0	60,0	16,0
2,7	44,0	8,0	8,0	60,0	16,0
2,8	44,0	8,0	8,0	60,0	16,0
2,9	44,0	8,0	8,0	60,0	16,0
3,0	44,0	8,0	8,0	60,0	16,0
3,1	44,0	8,0	8,0	60,0	16,0
3,2	44,0	12,0	8,0	64,0	20,0
3,3	44,0	12,0	8,0	64,0	20,0
3,4	44,0	12,0	8,0	64,0	20,0
3,5	44,0	12,0	8,0	64,0	20,0
3,6	44,0	12,0	8,0	64,0	20,0
3,7	44,0	12,0	8,0	64,0	20,0
3,8	44,0	12,0	8,0	64,0	20,0
3,9	44,0	12,0	8,0	64,0	20,0
4,0	44,0	12,0	8,0	64,0	20,0
4,1	44,0	12,0	8,0	64,0	20,0
4,2	44,0	12,0	8,0	64,0	20,0
4,3	44,0	16,0	8,0	68,0	24,0
4,4	44,0	16,0	8,0	68,0	24,0
4,5	44,0	16,0	8,0	68,0	24,0
4,6	44,0	16,0	8,0	68,0	24,0
4,7	44,0	16,0	8,0	68,0	24,0
4,8	44,0	16,0	8,0	68,0	24,0
4,9	44,0	16,0	8,0	68,0	24,0
5,0	44,0	16,0	8,0	68,0	24,0
5,1	44,0	16,0	8,0	68,0	24,0
5,2	44,0	16,0	8,0	68,0	24,0
5,3	44,0	16,0	8,0	68,0	24,0
5,4	44,0	20,0	8,0	72,0	28,0
5,5	44,0	20,0	8,0	72,0	28,0
5,6	44,0	20,0	8,0	72,0	28,0
5,7	44,0	20,0	8,0	72,0	28,0
5,8	44,0	20,0	8,0	72,0	28,0

5,9	44,0	20,0	8,0	72,0	28,0
6,0	44,0	20,0	8,0	72,0	28,0
6,1	44,0	20,0	8,0	72,0	28,0
6,2	44,0	20,0	8,0	72,0	28,0
6,3	44,0	20,0	8,0	72,0	28,0
6,4	44,0	24,0	8,0	76,0	32,0
6,5	44,0	24,0	8,0	76,0	32,0
6,6	44,0	24,0	8,0	76,0	32,0
6,7	44,0	24,0	8,0	76,0	32,0
6,8	44,0	24,0	8,0	76,0	32,0
6,9	44,0	24,0	8,0	76,0	32,0
7,0	44,0	24,0	8,0	76,0	32,0
7,1	44,0	24,0	8,0	76,0	32,0
7,2	44,0	24,0	8,0	76,0	32,0
7,3	44,0	24,0	8,0	76,0	32,0
7,4	44,0	24,0	8,0	76,0	32,0
7,5	44,0	28,0	8,0	80,0	36,0
7,6	44,0	28,0	8,0	80,0	36,0
7,7	44,0	28,0	8,0	80,0	36,0
7,8	44,0	28,0	8,0	80,0	36,0
7,9	44,0	28,0	8,0	80,0	36,0
8,0	44,0	28,0	8,0	80,0	36,0
8,1	44,0	28,0	8,0	80,0	36,0
8,2	44,0	28,0	8,0	80,0	36,0
8,3	44,0	28,0	8,0	80,0	36,0
8,4	44,0	28,0	8,0	80,0	36,0
8,5	44,0	28,0	8,0	80,0	36,0
8,6	44,0	32,0	8,0	84,0	40,0
8,7	44,0	32,0	8,0	84,0	40,0
8,8	44,0	32,0	8,0	84,0	40,0
8,9	44,0	32,0	8,0	84,0	40,0
9,0	44,0	32,0	8,0	84,0	40,0
9,1	44,0	32,0	8,0	84,0	40,0
9,2	44,0	32,0	8,0	84,0	40,0
9,3	44,0	32,0	8,0	84,0	40,0
9,4	44,0	32,0	8,0	84,0	40,0
9,5	44,0	32,0	8,0	84,0	40,0
9,6	44,0	36,0	8,0	88,0	44,0
9,7	44,0	36,0	8,0	88,0	44,0
9,8	44,0	36,0	8,0	88,0	44,0
9,9	44,0	36,0	8,0	88,0	44,0
10,0	44,0	36,0	8,0	88,0	44,0

Tabela I – Refúgio com 1,0m.

ZL = 10,8m	Comprimentos (m)			TOTAL do tramo de defesa (m)	
	Afastamento X (m)	TD	Corpo	AS	com TD
2,0	48,0	4,0	8,0	60,0	12,0
2,1	48,0	8,0	8,0	64,0	16,0
2,2	48,0	8,0	8,0	64,0	16,0
2,3	48,0	8,0	8,0	64,0	16,0
2,4	48,0	8,0	8,0	64,0	16,0
2,5	48,0	8,0	8,0	64,0	16,0
2,6	48,0	8,0	8,0	64,0	16,0
2,7	48,0	8,0	8,0	64,0	16,0
2,8	48,0	8,0	8,0	64,0	16,0
2,9	48,0	8,0	8,0	64,0	16,0
3,0	48,0	8,0	8,0	64,0	16,0
3,1	48,0	8,0	8,0	64,0	16,0
3,2	48,0	12,0	8,0	68,0	20,0
3,3	48,0	12,0	8,0	68,0	20,0
3,4	48,0	12,0	8,0	68,0	20,0
3,5	48,0	12,0	8,0	68,0	20,0
3,6	48,0	12,0	8,0	68,0	20,0
3,7	48,0	12,0	8,0	68,0	20,0
3,8	48,0	12,0	8,0	68,0	20,0
3,9	48,0	12,0	8,0	68,0	20,0
4,0	48,0	12,0	8,0	68,0	20,0
4,1	48,0	12,0	8,0	68,0	20,0
4,2	48,0	12,0	8,0	68,0	20,0
4,3	48,0	16,0	8,0	72,0	24,0
4,4	48,0	16,0	8,0	72,0	24,0
4,5	48,0	16,0	8,0	72,0	24,0
4,6	48,0	16,0	8,0	72,0	24,0
4,7	48,0	16,0	8,0	72,0	24,0
4,8	48,0	16,0	8,0	72,0	24,0
4,9	48,0	16,0	8,0	72,0	24,0
5,0	48,0	16,0	8,0	72,0	24,0
5,1	48,0	16,0	8,0	72,0	24,0
5,2	48,0	16,0	8,0	72,0	24,0
5,3	48,0	16,0	8,0	72,0	24,0
5,4	48,0	20,0	8,0	76,0	28,0
5,5	48,0	20,0	8,0	76,0	28,0
5,6	48,0	20,0	8,0	76,0	28,0
5,7	48,0	20,0	8,0	76,0	28,0
5,8	48,0	20,0	8,0	76,0	28,0
5,9	48,0	20,0	8,0	76,0	28,0
6,0	48,0	20,0	8,0	76,0	28,0
6,1	48,0	20,0	8,0	76,0	28,0
6,2	48,0	20,0	8,0	76,0	28,0
6,3	48,0	20,0	8,0	76,0	28,0
6,4	48,0	24,0	8,0	80,0	32,0
6,5	48,0	24,0	8,0	80,0	32,0
6,6	48,0	24,0	8,0	80,0	32,0
6,7	48,0	24,0	8,0	80,0	32,0

6,8	48,0	24,0	8,0	80,0	32,0
6,9	48,0	24,0	8,0	80,0	32,0
7,0	48,0	24,0	8,0	80,0	32,0
7,1	48,0	24,0	8,0	80,0	32,0
7,2	48,0	24,0	8,0	80,0	32,0
7,3	48,0	24,0	8,0	80,0	32,0
7,4	48,0	24,0	8,0	80,0	32,0
7,5	48,0	28,0	8,0	84,0	36,0
7,6	48,0	28,0	8,0	84,0	36,0
7,7	48,0	28,0	8,0	84,0	36,0
7,8	48,0	28,0	8,0	84,0	36,0
7,9	48,0	28,0	8,0	84,0	36,0
8,0	48,0	28,0	8,0	84,0	36,0
8,1	48,0	28,0	8,0	84,0	36,0
8,2	48,0	28,0	8,0	84,0	36,0
8,3	48,0	28,0	8,0	84,0	36,0
8,4	48,0	28,0	8,0	84,0	36,0
8,5	48,0	28,0	8,0	84,0	36,0
8,6	48,0	32,0	8,0	88,0	40,0
8,7	48,0	32,0	8,0	88,0	40,0
8,8	48,0	32,0	8,0	88,0	40,0
8,9	48,0	32,0	8,0	88,0	40,0
9,0	48,0	32,0	8,0	88,0	40,0
9,1	48,0	32,0	8,0	88,0	40,0
9,2	48,0	32,0	8,0	88,0	40,0
9,3	48,0	32,0	8,0	88,0	40,0
9,4	48,0	32,0	8,0	88,0	40,0
9,5	48,0	32,0	8,0	88,0	40,0
9,6	48,0	36,0	8,0	92,0	44,0
9,7	48,0	36,0	8,0	92,0	44,0
9,8	48,0	36,0	8,0	92,0	44,0
9,9	48,0	36,0	8,0	92,0	44,0
10,0	48,0	36,0	8,0	92,0	44,0
10,1	48,0	36,0	8,0	92,0	44,0
10,2	48,0	36,0	8,0	92,0	44,0
10,3	48,0	36,0	8,0	92,0	44,0
10,4	48,0	36,0	8,0	92,0	44,0
10,5	48,0	36,0	8,0	92,0	44,0
10,6	48,0	36,0	8,0	92,0	44,0
10,7	48,0	40,0	8,0	96,0	48,0
10,8	48,0	40,0	8,0	96,0	48,0

Tabela II – Acostamento com 2,5m.

ZL = 4,0m	Comprimentos (m)			TOTAL do tramo de defesa (m)		
	Afastamento X (m)	TD	Corpo	AS	com TD	com TR
	3,5	16,0	4,0	8,0	28,0	12,0
	3,6	16,0	8,0	8,0	32,0	16,0
	3,7	16,0	8,0	8,0	32,0	16,0
	3,8	16,0	8,0	8,0	32,0	16,0
	3,9	16,0	8,0	8,0	32,0	16,0
	4,0	16,0	8,0	8,0	32,0	16,0

ZL = 4,8m e 5,0m	Comprimentos (m)			TOTAL do tramo de defesa (m)		
	Afastamento X (m)	TD	Corpo	AS	com TD	com TR
	3,5	20,0	4,0	8,0	32,0	12,0
	3,6	20,0	8,0	8,0	36,0	16,0
	3,7	20,0	8,0	8,0	36,0	16,0
	3,8	20,0	8,0	8,0	36,0	16,0
	3,9	20,0	8,0	8,0	36,0	16,0
	4,0	20,0	8,0	8,0	36,0	16,0
	4,1	20,0	8,0	8,0	36,0	16,0
	4,2	20,0	8,0	8,0	36,0	16,0
	4,3	20,0	8,0	8,0	36,0	16,0
	4,4	20,0	8,0	8,0	36,0	16,0
	4,5	20,0	8,0	8,0	36,0	16,0
	4,6	20,0	8,0	8,0	36,0	16,0
	4,7	20,0	12,0	8,0	40,0	20,0
	4,8	20,0	12,0	8,0	40,0	20,0
	4,9	20,0	12,0	8,0	40,0	20,0
	5,0	20,0	12,0	8,0	40,0	20,0

Tabela II – Acostamento com 2,5m.

ZL = 5,6m e 6,0m	Comprimentos (m)			TOTAL do tramo de defesa (m)	
	Afastamento X (m)	TD	Corpo	AS	com TD
3,5	24,0	4,0	8,0	36,0	12,0
3,6	24,0	8,0	8,0	40,0	16,0
3,7	24,0	8,0	8,0	40,0	16,0
3,8	24,0	8,0	8,0	40,0	16,0
3,9	24,0	8,0	8,0	40,0	16,0
4,0	24,0	8,0	8,0	40,0	16,0
4,1	24,0	8,0	8,0	40,0	16,0
4,2	24,0	8,0	8,0	40,0	16,0
4,3	24,0	8,0	8,0	40,0	16,0
4,4	24,0	8,0	8,0	40,0	16,0
4,5	24,0	8,0	8,0	40,0	16,0
4,6	24,0	8,0	8,0	40,0	16,0
4,7	24,0	12,0	8,0	44,0	20,0
4,8	24,0	12,0	8,0	44,0	20,0
4,9	24,0	12,0	8,0	44,0	20,0
5,0	24,0	12,0	8,0	44,0	20,0
5,1	24,0	12,0	8,0	44,0	20,0
5,2	24,0	12,0	8,0	44,0	20,0
5,3	24,0	12,0	8,0	44,0	20,0
5,4	24,0	12,0	8,0	44,0	20,0
5,5	24,0	12,0	8,0	44,0	20,0
5,6	24,0	12,0	8,0	44,0	20,0
5,7	24,0	12,0	8,0	44,0	20,0
5,8	24,0	16,0	8,0	48,0	24,0
5,9	24,0	16,0	8,0	48,0	24,0
6,0	24,0	16,0	8,0	48,0	24,0

Tabela II – Acostamento com 2,5m.

ZL = 6,7m	Comprimentos (m)			TOTAL do tramo de defesa (m)	
Afastamento X (m)	TD	Corpo	AS	com TD	com TR
3,5	28,0	4,0	8,0	40,0	12,0
3,6	28,0	8,0	8,0	44,0	16,0
3,7	28,0	8,0	8,0	44,0	16,0
3,8	28,0	8,0	8,0	44,0	16,0
3,9	28,0	8,0	8,0	44,0	16,0
4,0	28,0	8,0	8,0	44,0	16,0
4,1	28,0	8,0	8,0	44,0	16,0
4,2	28,0	8,0	8,0	44,0	16,0
4,3	28,0	8,0	8,0	44,0	16,0
4,4	28,0	8,0	8,0	44,0	16,0
4,5	28,0	8,0	8,0	44,0	16,0
4,6	28,0	8,0	8,0	44,0	16,0
4,7	28,0	12,0	8,0	48,0	20,0
4,8	28,0	12,0	8,0	48,0	20,0
4,9	28,0	12,0	8,0	48,0	20,0
5,0	28,0	12,0	8,0	48,0	20,0
5,1	28,0	12,0	8,0	48,0	20,0
5,2	28,0	12,0	8,0	48,0	20,0
5,3	28,0	12,0	8,0	48,0	20,0
5,4	28,0	12,0	8,0	48,0	20,0
5,5	28,0	12,0	8,0	48,0	20,0
5,6	28,0	12,0	8,0	48,0	20,0
5,7	28,0	12,0	8,0	48,0	20,0
5,8	28,0	16,0	8,0	52,0	24,0
5,9	28,0	16,0	8,0	52,0	24,0
6,0	28,0	16,0	8,0	52,0	24,0
6,1	28,0	16,0	8,0	52,0	24,0
6,2	28,0	16,0	8,0	52,0	24,0
6,3	28,0	16,0	8,0	52,0	24,0
6,4	28,0	16,0	8,0	52,0	24,0
6,5	28,0	16,0	8,0	52,0	24,0
6,6	28,0	16,0	8,0	52,0	24,0
6,7	28,0	16,0	8,0	52,0	24,0

Tabela II – Acostamento com 2,5m.

ZL = 8,3m	Comprimentos (m)			TOTAL do tramo de defesa (m)		
	Afastamento X (m)	TD	Corpo	AS	com TD	com TR
	3,5	32,0	4,0	8,0	44,0	12,0
	3,6	32,0	8,0	8,0	48,0	16,0
	3,7	32,0	8,0	8,0	48,0	16,0
	3,8	32,0	8,0	8,0	48,0	16,0
	3,9	32,0	8,0	8,0	48,0	16,0
	4,0	32,0	8,0	8,0	48,0	16,0
	4,1	32,0	8,0	8,0	48,0	16,0
	4,2	32,0	8,0	8,0	48,0	16,0
	4,3	32,0	8,0	8,0	48,0	16,0
	4,4	32,0	8,0	8,0	48,0	16,0
	4,5	32,0	8,0	8,0	48,0	16,0
	4,6	32,0	8,0	8,0	48,0	16,0
	4,7	32,0	12,0	8,0	52,0	20,0
	4,8	32,0	12,0	8,0	52,0	20,0
	4,9	32,0	12,0	8,0	52,0	20,0
	5,0	32,0	12,0	8,0	52,0	20,0
	5,1	32,0	12,0	8,0	52,0	20,0
	5,2	32,0	12,0	8,0	52,0	20,0
	5,3	32,0	12,0	8,0	52,0	20,0
	5,4	32,0	12,0	8,0	52,0	20,0
	5,5	32,0	12,0	8,0	52,0	20,0
	5,6	32,0	12,0	8,0	52,0	20,0
	5,7	32,0	12,0	8,0	52,0	20,0
	5,8	32,0	16,0	8,0	56,0	24,0
	5,9	32,0	16,0	8,0	56,0	24,0
	6,0	32,0	16,0	8,0	56,0	24,0
	6,1	32,0	16,0	8,0	56,0	24,0
	6,2	32,0	16,0	8,0	56,0	24,0
	6,3	32,0	16,0	8,0	56,0	24,0
	6,4	32,0	16,0	8,0	56,0	24,0
	6,5	32,0	16,0	8,0	56,0	24,0
	6,6	32,0	16,0	8,0	56,0	24,0
	6,7	32,0	16,0	8,0	56,0	24,0
	6,8	32,0	16,0	8,0	56,0	24,0
	6,9	32,0	20,0	8,0	60,0	28,0
	7,0	32,0	20,0	8,0	60,0	28,0
	7,1	32,0	20,0	8,0	60,0	28,0
	7,2	32,0	20,0	8,0	60,0	28,0
	7,3	32,0	20,0	8,0	60,0	28,0
	7,4	32,0	20,0	8,0	60,0	28,0
	7,5	32,0	20,0	8,0	60,0	28,0
	7,6	32,0	20,0	8,0	60,0	28,0
	7,7	32,0	20,0	8,0	60,0	28,0
	7,8	32,0	20,0	8,0	60,0	28,0
	7,9	32,0	24,0	8,0	64,0	32,0
	8,0	32,0	24,0	8,0	64,0	32,0
	8,1	32,0	24,0	8,0	64,0	32,0
	8,2	32,0	24,0	8,0	64,0	32,0
	8,3	32,0	24,0	8,0	64,0	32,0

Tabela II – Acostamento com 2,5m.

ZL = 9,0m	Comprimentos (m)			TOTAL do tramo de defesa (m)		
	Afastamento X (m)	TD	Corpo	AS	com TD	com TR
	3,5	36,0	4,0	8,0	48,0	12,0
	3,6	36,0	8,0	8,0	52,0	16,0
	3,7	36,0	8,0	8,0	52,0	16,0
	3,8	36,0	8,0	8,0	52,0	16,0
	3,9	36,0	8,0	8,0	52,0	16,0
	4,0	36,0	8,0	8,0	52,0	16,0
	4,1	36,0	8,0	8,0	52,0	16,0
	4,2	36,0	8,0	8,0	52,0	16,0
	4,3	36,0	8,0	8,0	52,0	16,0
	4,4	36,0	8,0	8,0	52,0	16,0
	4,5	36,0	8,0	8,0	52,0	16,0
	4,6	36,0	8,0	8,0	52,0	16,0
	4,7	36,0	12,0	8,0	56,0	20,0
	4,8	36,0	12,0	8,0	56,0	20,0
	4,9	36,0	12,0	8,0	56,0	20,0
	5,0	36,0	12,0	8,0	56,0	20,0
	5,1	36,0	12,0	8,0	56,0	20,0
	5,2	36,0	12,0	8,0	56,0	20,0
	5,3	36,0	12,0	8,0	56,0	20,0
	5,4	36,0	12,0	8,0	56,0	20,0
	5,5	36,0	12,0	8,0	56,0	20,0
	5,6	36,0	12,0	8,0	56,0	20,0
	5,7	36,0	12,0	8,0	56,0	20,0
	5,8	36,0	16,0	8,0	60,0	24,0
	5,9	36,0	16,0	8,0	60,0	24,0
	6,0	36,0	16,0	8,0	60,0	24,0
	6,1	36,0	16,0	8,0	60,0	24,0
	6,2	36,0	16,0	8,0	60,0	24,0
	6,3	36,0	16,0	8,0	60,0	24,0
	6,4	36,0	16,0	8,0	60,0	24,0
	6,5	36,0	16,0	8,0	60,0	24,0
	6,6	36,0	16,0	8,0	60,0	24,0
	6,7	36,0	16,0	8,0	60,0	24,0
	6,8	36,0	16,0	8,0	60,0	24,0
	6,9	36,0	20,0	8,0	64,0	28,0
	7,0	36,0	20,0	8,0	64,0	28,0
	7,1	36,0	20,0	8,0	64,0	28,0
	7,2	36,0	20,0	8,0	64,0	28,0
	7,3	36,0	20,0	8,0	64,0	28,0
	7,4	36,0	20,0	8,0	64,0	28,0
	7,5	36,0	20,0	8,0	64,0	28,0
	7,6	36,0	20,0	8,0	64,0	28,0
	7,7	36,0	20,0	8,0	64,0	28,0
	7,8	36,0	20,0	8,0	64,0	28,0
	7,9	36,0	24,0	8,0	68,0	32,0
	8,0	36,0	24,0	8,0	68,0	32,0
	8,1	36,0	24,0	8,0	68,0	32,0
	8,2	36,0	24,0	8,0	68,0	32,0
	8,3	36,0	24,0	8,0	68,0	32,0
	8,4	36,0	24,0	8,0	68,0	32,0
	8,5	36,0	24,0	8,0	68,0	32,0
	8,6	36,0	24,0	8,0	68,0	32,0

8,7	36,0	24,0	8,0	68,0	32,0
8,8	36,0	24,0	8,0	68,0	32,0
8,9	36,0	24,0	8,0	68,0	32,0
9,0	36,0	28,0	8,0	72,0	36,0

Tabela II – Acostamento com 2,5m.

ZL = 10,0m Afastamento X (m)	Comprimentos (m)			TOTAL do tramo de defesa (m)	
	TD	Corpo	AS	com TD	com TR
3,5	40,0	4,0	8,0	52,0	12,0
3,6	40,0	8,0	8,0	56,0	16,0
3,7	40,0	8,0	8,0	56,0	16,0
3,8	40,0	8,0	8,0	56,0	16,0
3,9	40,0	8,0	8,0	56,0	16,0
4,0	40,0	8,0	8,0	56,0	16,0
4,1	40,0	8,0	8,0	56,0	16,0
4,2	40,0	8,0	8,0	56,0	16,0
4,3	40,0	8,0	8,0	56,0	16,0
4,4	40,0	8,0	8,0	56,0	16,0
4,5	40,0	8,0	8,0	56,0	16,0
4,6	40,0	8,0	8,0	56,0	16,0
4,7	40,0	12,0	8,0	60,0	20,0
4,8	40,0	12,0	8,0	60,0	20,0
4,9	40,0	12,0	8,0	60,0	20,0
5,0	40,0	12,0	8,0	60,0	20,0
5,1	40,0	12,0	8,0	60,0	20,0
5,2	40,0	12,0	8,0	60,0	20,0
5,3	40,0	12,0	8,0	60,0	20,0
5,4	40,0	12,0	8,0	60,0	20,0
5,5	40,0	12,0	8,0	60,0	20,0
5,6	40,0	12,0	8,0	60,0	20,0
5,7	40,0	12,0	8,0	60,0	20,0
5,8	40,0	16,0	8,0	64,0	24,0
5,9	40,0	16,0	8,0	64,0	24,0
6,0	40,0	16,0	8,0	64,0	24,0
6,1	40,0	16,0	8,0	64,0	24,0
6,2	40,0	16,0	8,0	64,0	24,0
6,3	40,0	16,0	8,0	64,0	24,0
6,4	40,0	16,0	8,0	64,0	24,0
6,5	40,0	16,0	8,0	64,0	24,0
6,6	40,0	16,0	8,0	64,0	24,0
6,7	40,0	16,0	8,0	64,0	24,0
6,8	40,0	16,0	8,0	64,0	24,0
6,9	40,0	20,0	8,0	68,0	28,0
7,0	40,0	20,0	8,0	68,0	28,0
7,1	40,0	20,0	8,0	68,0	28,0
7,2	40,0	20,0	8,0	68,0	28,0
7,3	40,0	20,0	8,0	68,0	28,0
7,4	40,0	20,0	8,0	68,0	28,0
7,5	40,0	20,0	8,0	68,0	28,0
7,6	40,0	20,0	8,0	68,0	28,0
7,7	40,0	20,0	8,0	68,0	28,0
7,8	40,0	20,0	8,0	68,0	28,0
7,9	40,0	24,0	8,0	72,0	32,0
8,0	40,0	24,0	8,0	72,0	32,0
8,1	40,0	24,0	8,0	72,0	32,0
8,2	40,0	24,0	8,0	72,0	32,0
8,3	40,0	24,0	8,0	72,0	32,0
8,4	40,0	24,0	8,0	72,0	32,0
8,5	40,0	24,0	8,0	72,0	32,0
8,6	40,0	24,0	8,0	72,0	32,0

8,7	40,0	24,0	8,0	72,0	32,0
8,8	40,0	24,0	8,0	72,0	32,0
8,9	40,0	24,0	8,0	72,0	32,0
9,0	40,0	28,0	8,0	76,0	36,0
9,1	40,0	28,0	8,0	76,0	36,0
9,2	40,0	28,0	8,0	76,0	36,0
9,3	40,0	28,0	8,0	76,0	36,0
9,4	40,0	28,0	8,0	76,0	36,0
9,5	40,0	28,0	8,0	76,0	36,0
9,6	40,0	28,0	8,0	76,0	36,0
9,7	40,0	28,0	8,0	76,0	36,0
9,8	40,0	28,0	8,0	76,0	36,0
9,9	40,0	28,0	8,0	76,0	36,0
10,0	40,0	28,0	8,0	76,0	36,0

Tabela II – Acostamento com 2,5m.

ZL = 10,8m	Comprimentos (m)			TOTAL do tramo de defesa (m)		
	Afastamento X (m)	TD	Corpo	AS	com TD	com TR
	3,5	44,0	4,0	8,0	56,0	12,0
	3,6	44,0	8,0	8,0	60,0	16,0
	3,7	44,0	8,0	8,0	60,0	16,0
	3,8	44,0	8,0	8,0	60,0	16,0
	3,9	44,0	8,0	8,0	60,0	16,0
	4,0	44,0	8,0	8,0	60,0	16,0
	4,1	44,0	8,0	8,0	60,0	16,0
	4,2	44,0	8,0	8,0	60,0	16,0
	4,3	44,0	8,0	8,0	60,0	16,0
	4,4	44,0	8,0	8,0	60,0	16,0
	4,5	44,0	8,0	8,0	60,0	16,0
	4,6	44,0	8,0	8,0	60,0	16,0
	4,7	44,0	12,0	8,0	64,0	20,0
	4,8	44,0	12,0	8,0	64,0	20,0
	4,9	44,0	12,0	8,0	64,0	20,0
	5,0	44,0	12,0	8,0	64,0	20,0
	5,1	44,0	12,0	8,0	64,0	20,0
	5,2	44,0	12,0	8,0	64,0	20,0
	5,3	44,0	12,0	8,0	64,0	20,0
	5,4	44,0	12,0	8,0	64,0	20,0
	5,5	44,0	12,0	8,0	64,0	20,0
	5,6	44,0	12,0	8,0	64,0	20,0
	5,7	44,0	12,0	8,0	64,0	20,0
	5,8	44,0	16,0	8,0	68,0	24,0
	5,9	44,0	16,0	8,0	68,0	24,0
	6,0	44,0	16,0	8,0	68,0	24,0
	6,1	44,0	16,0	8,0	68,0	24,0
	6,2	44,0	16,0	8,0	68,0	24,0
	6,3	44,0	16,0	8,0	68,0	24,0
	6,4	44,0	16,0	8,0	68,0	24,0
	6,5	44,0	16,0	8,0	68,0	24,0
	6,6	44,0	16,0	8,0	68,0	24,0
	6,7	44,0	16,0	8,0	68,0	24,0
	6,8	44,0	16,0	8,0	68,0	24,0
	6,9	44,0	20,0	8,0	72,0	28,0
	7,0	44,0	20,0	8,0	72,0	28,0
	7,1	44,0	20,0	8,0	72,0	28,0
	7,2	44,0	20,0	8,0	72,0	28,0
	7,3	44,0	20,0	8,0	72,0	28,0
	7,4	44,0	20,0	8,0	72,0	28,0
	7,5	44,0	20,0	8,0	72,0	28,0
	7,6	44,0	20,0	8,0	72,0	28,0
	7,7	44,0	20,0	8,0	72,0	28,0
	7,8	44,0	20,0	8,0	72,0	28,0
	7,9	44,0	24,0	8,0	76,0	32,0
	8,0	44,0	24,0	8,0	76,0	32,0
	8,1	44,0	24,0	8,0	76,0	32,0
	8,2	44,0	24,0	8,0	76,0	32,0
	8,3	44,0	24,0	8,0	76,0	32,0
	8,4	44,0	24,0	8,0	76,0	32,0
	8,5	44,0	24,0	8,0	76,0	32,0
	8,6	44,0	24,0	8,0	76,0	32,0

8,7	44,0	24,0	8,0	76,0	32,0
8,8	44,0	24,0	8,0	76,0	32,0
8,9	44,0	24,0	8,0	76,0	32,0
9,0	44,0	28,0	8,0	80,0	36,0
9,1	44,0	28,0	8,0	80,0	36,0
9,2	44,0	28,0	8,0	80,0	36,0
9,3	44,0	28,0	8,0	80,0	36,0
9,4	44,0	28,0	8,0	80,0	36,0
9,5	44,0	28,0	8,0	80,0	36,0
9,6	44,0	28,0	8,0	80,0	36,0
9,7	44,0	28,0	8,0	80,0	36,0
9,8	44,0	28,0	8,0	80,0	36,0
9,9	44,0	28,0	8,0	80,0	36,0
10,0	44,0	28,0	8,0	80,0	36,0
10,1	44,0	32,0	8,0	84,0	40,0
10,2	44,0	32,0	8,0	84,0	40,0
10,3	44,0	32,0	8,0	84,0	40,0
10,4	44,0	32,0	8,0	84,0	40,0
10,5	44,0	32,0	8,0	84,0	40,0
10,6	44,0	32,0	8,0	84,0	40,0
10,7	44,0	32,0	8,0	84,0	40,0
10,8	44,0	32,0	8,0	84,0	40,0

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Figura 17: Detalhe fixação
Figura 18: Detalhe fixação

1	0,17
2	0,20
3	0,26
4	0,40
5	0,53
6	0,69
7	0,90

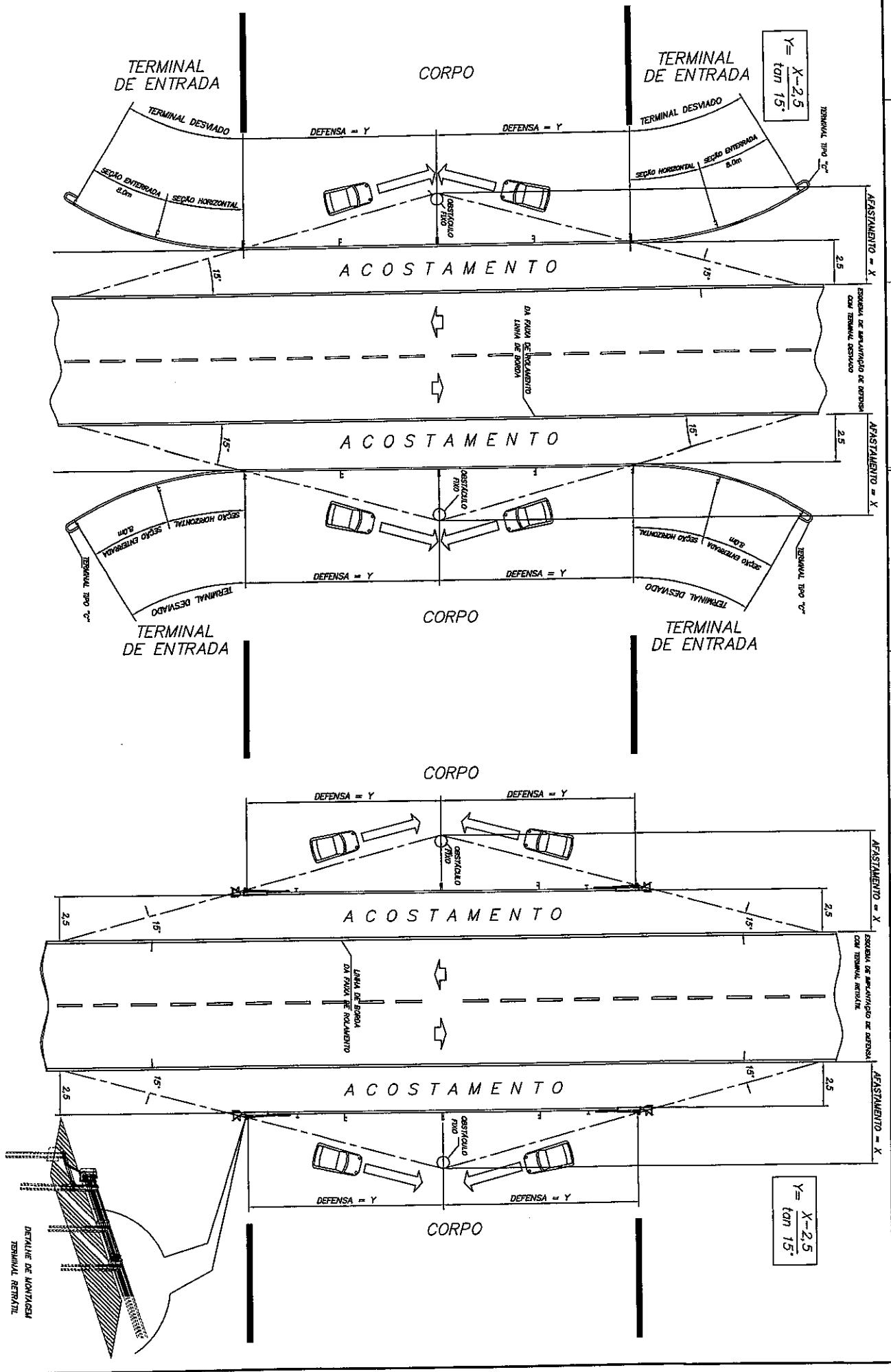


Figura 01:
ESQUEMA DE DEFENSAS E TERMINAIS PARA PISTA SIMPLES

NOTAS
1- ESTES DESPONTES ESTÃO DE ACORDO COM A NORMA NBR-15448
2- TODAS AS DIMENSÕES ESTÃO EM METRO SALVO OQUE INDICADO

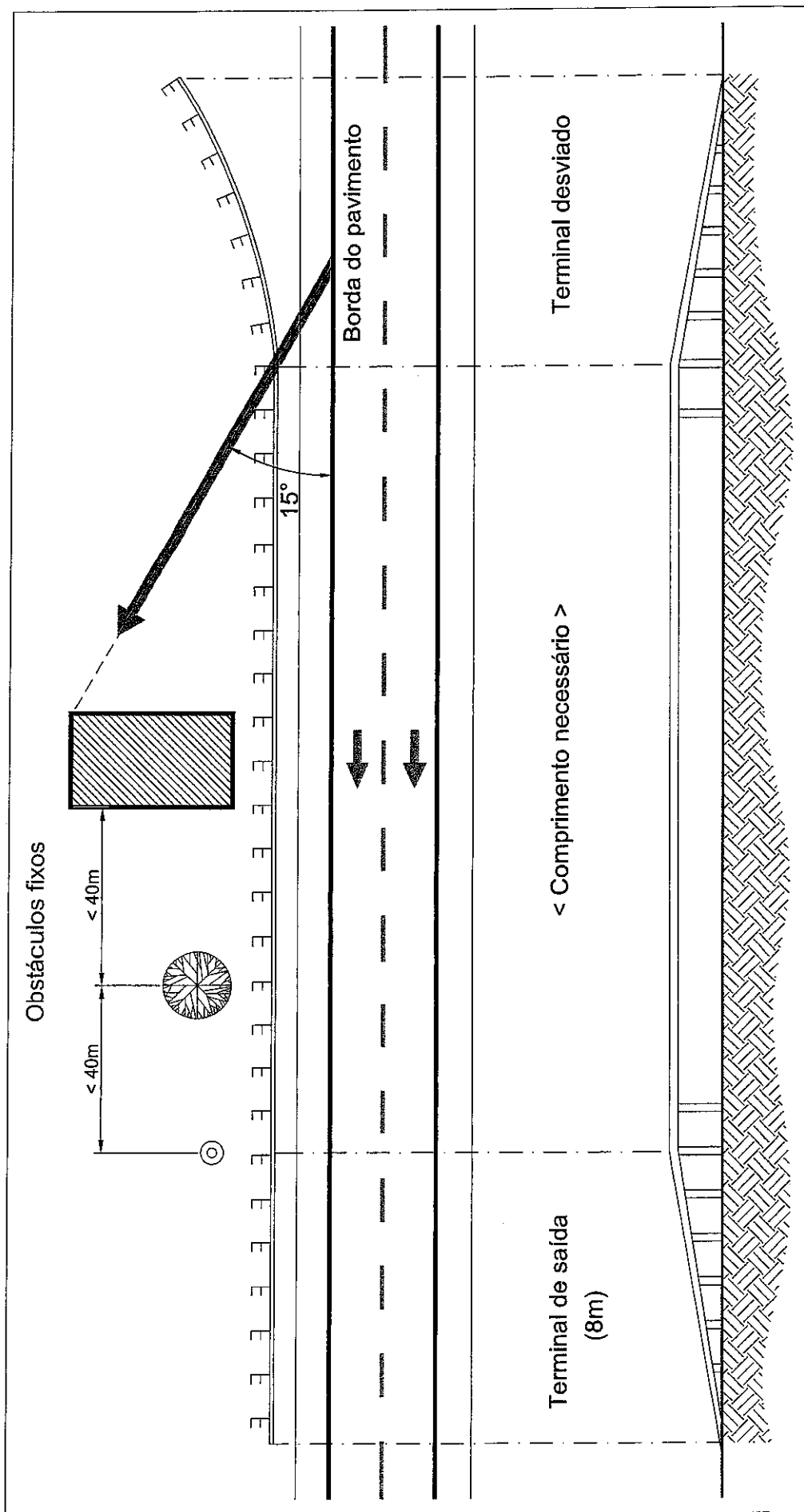
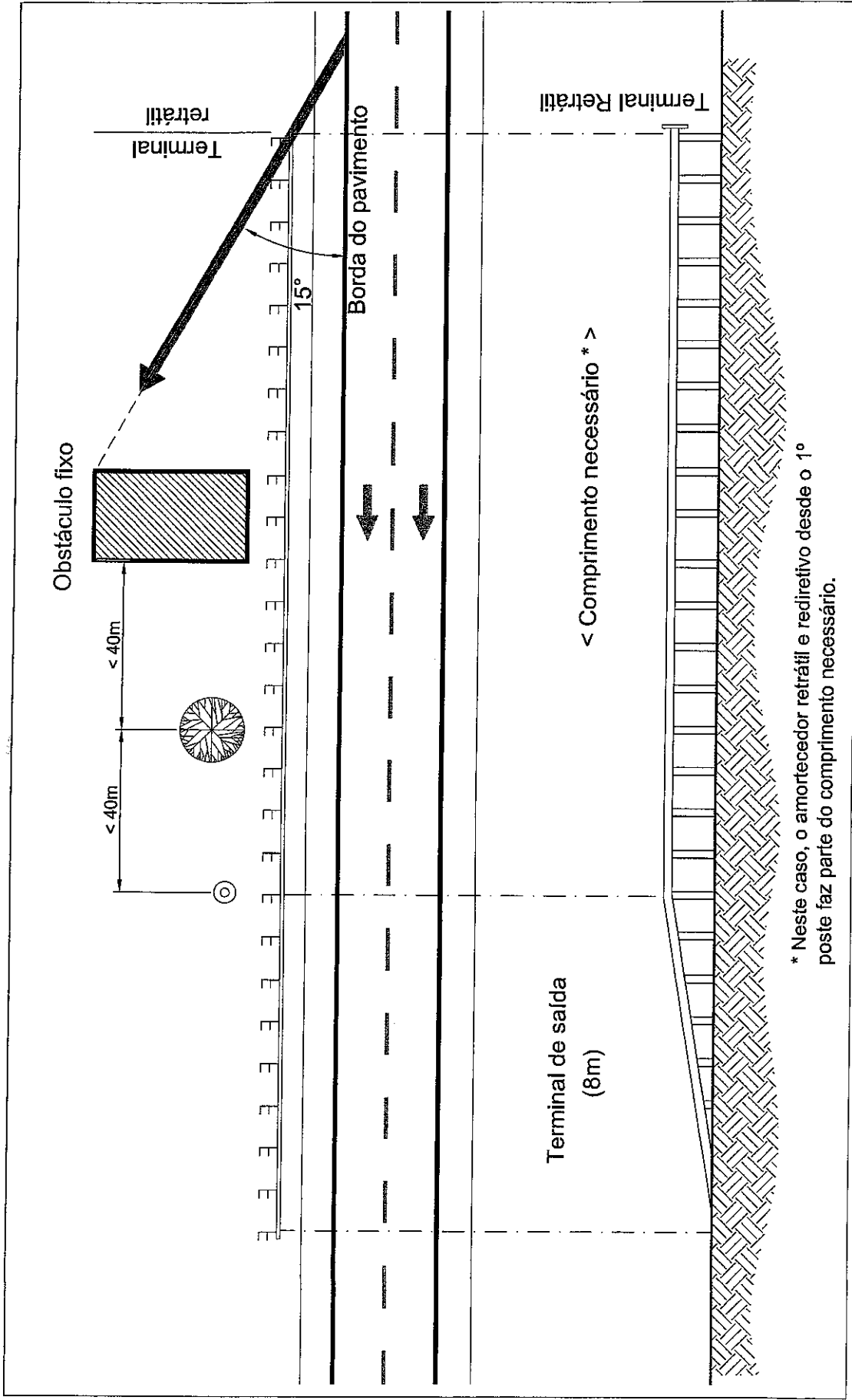


FIGURA 3A - Obstáculos múltiplos com terminal desviado em pista dupla



* Neste caso, o amortecedor retrátil e rediretivo desde o 1º poste faz parte do comprimento necessário.

FIGURA 3B - Obstáculos múltiplos com terminal retrátil em pista dupla

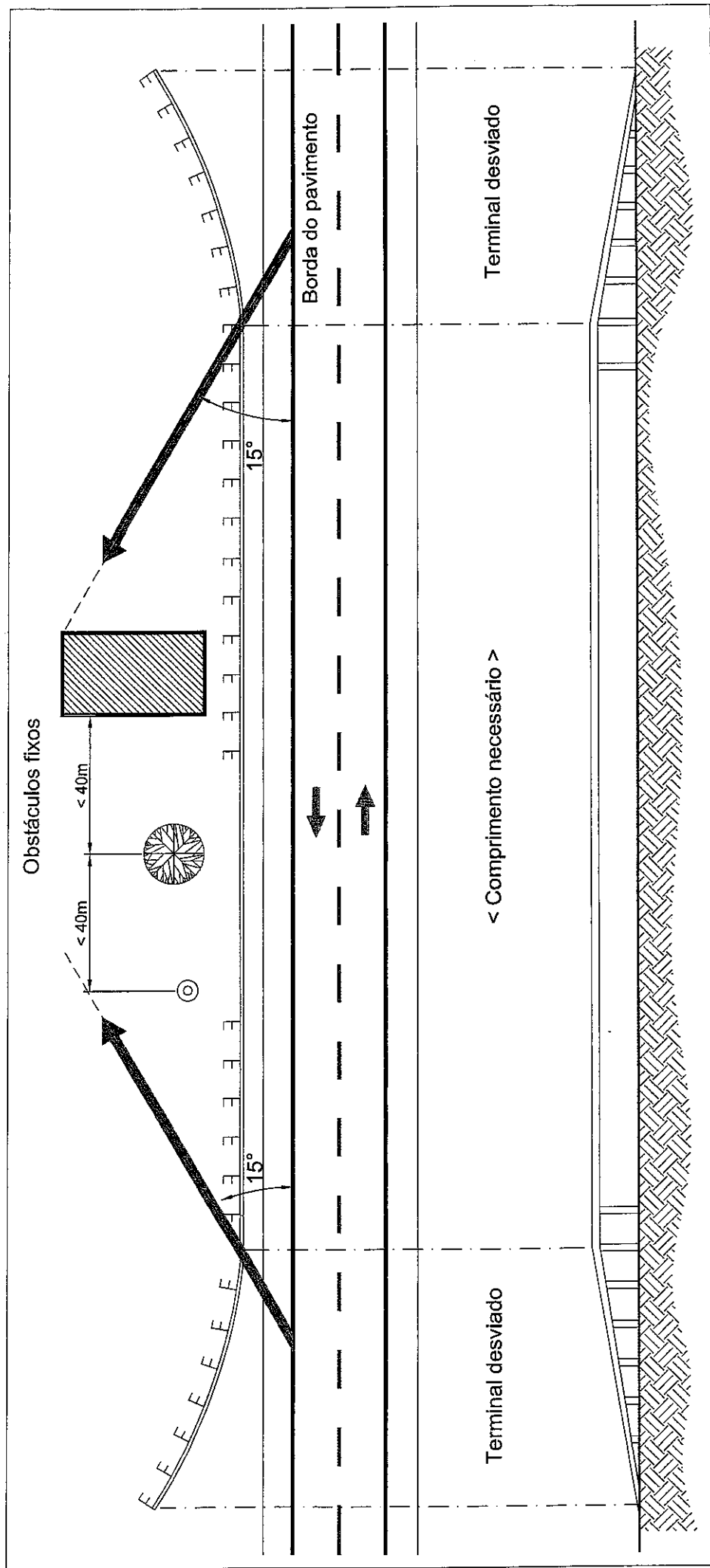
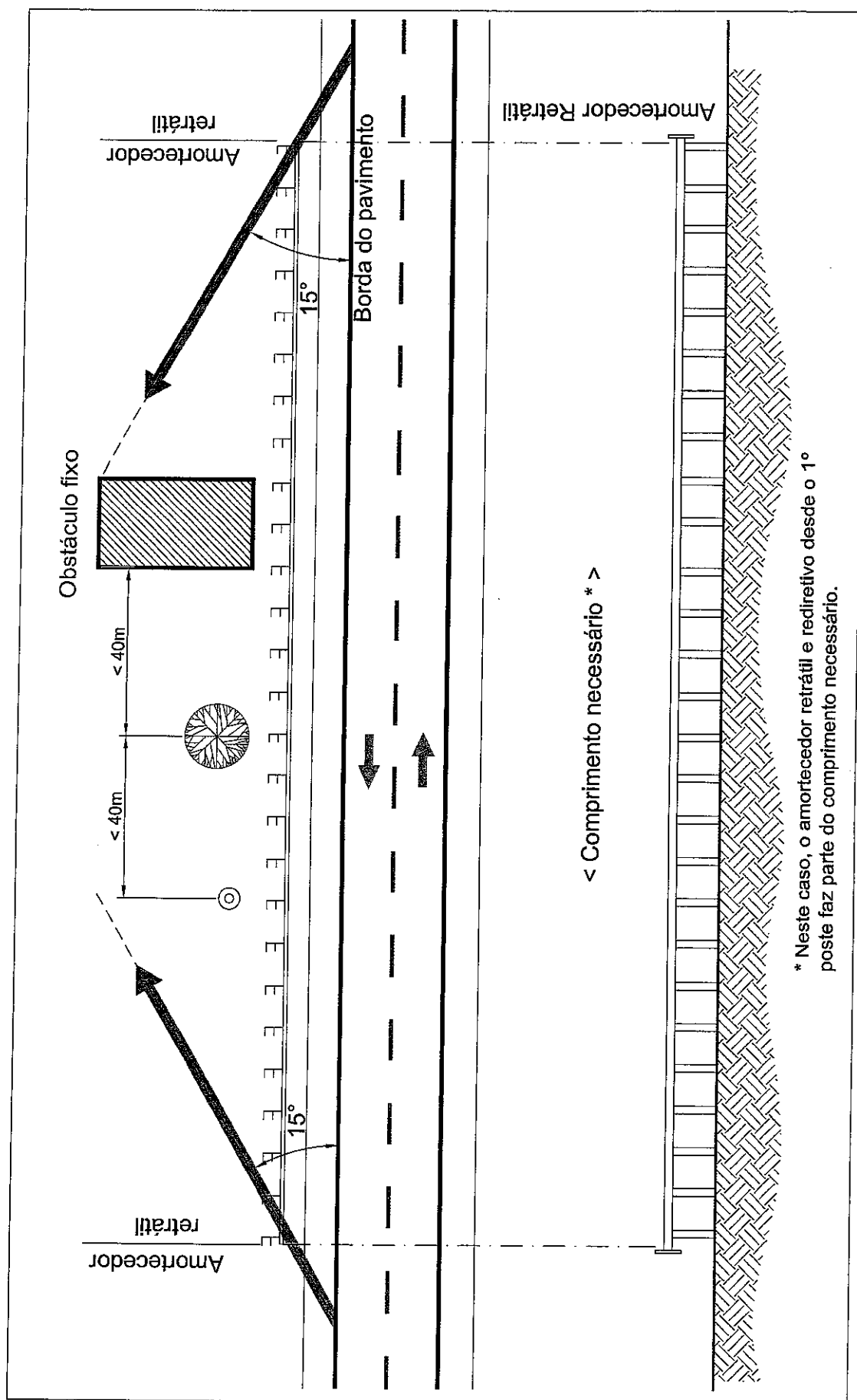
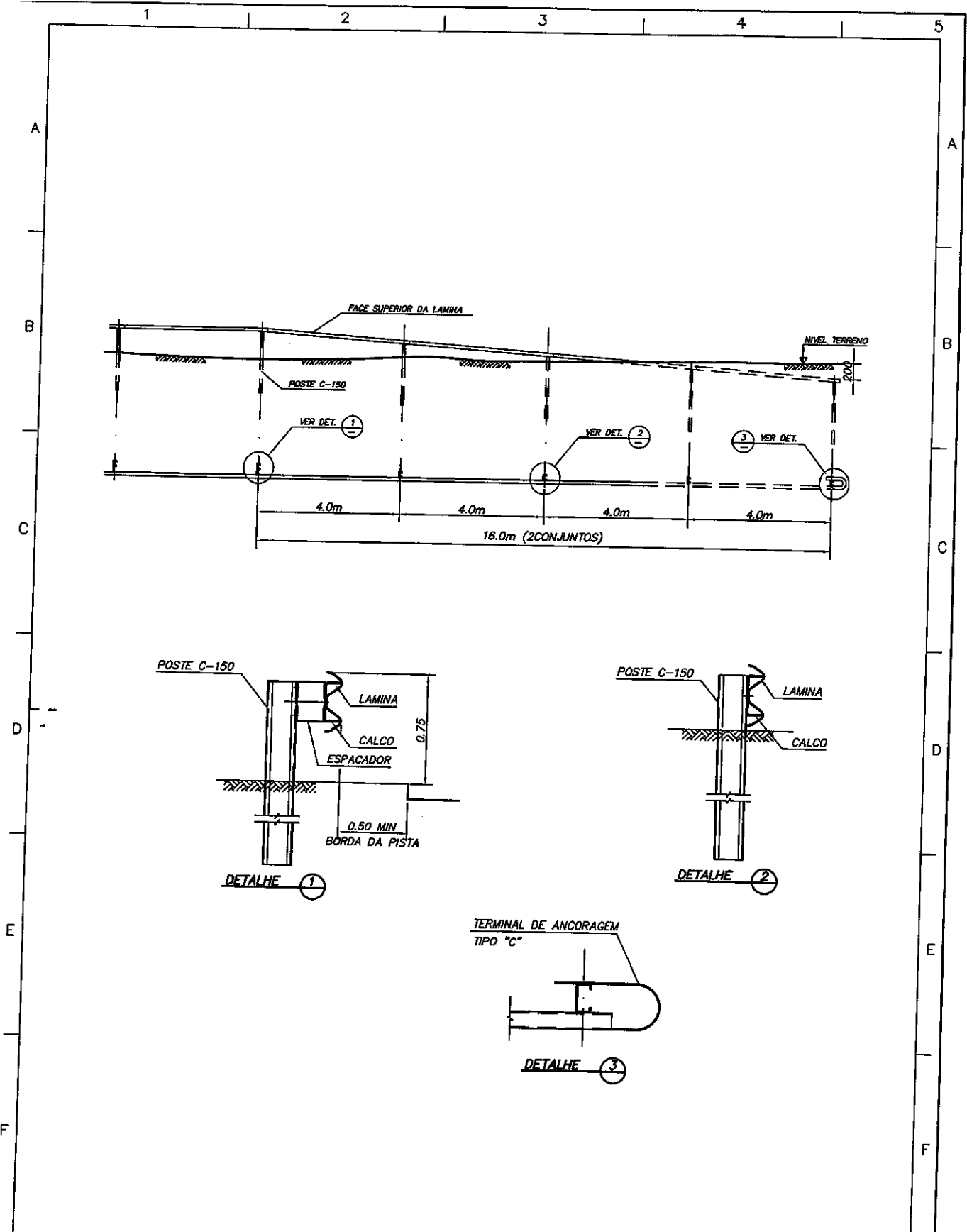


FIGURA 4A - Obstáculos múltiplos com terminal desviado em pista simples



* Neste caso, o amortecedor retrátil e rediretivo desde o 1º poste faz parte do comprimento necessário.

FIGURA 4B - Obstáculos múltiplos com terminia retrátil em pista simples



A4	PROJEÇÃO	NOME	DATA
	ESCALA	DESENHO	
		PROJETO	
		VERIFICAÇÃO	
	APROVAÇÃO		
	NÚMERO	FOLHA	

FIGURA 5-TERMINAL ENTERRADO

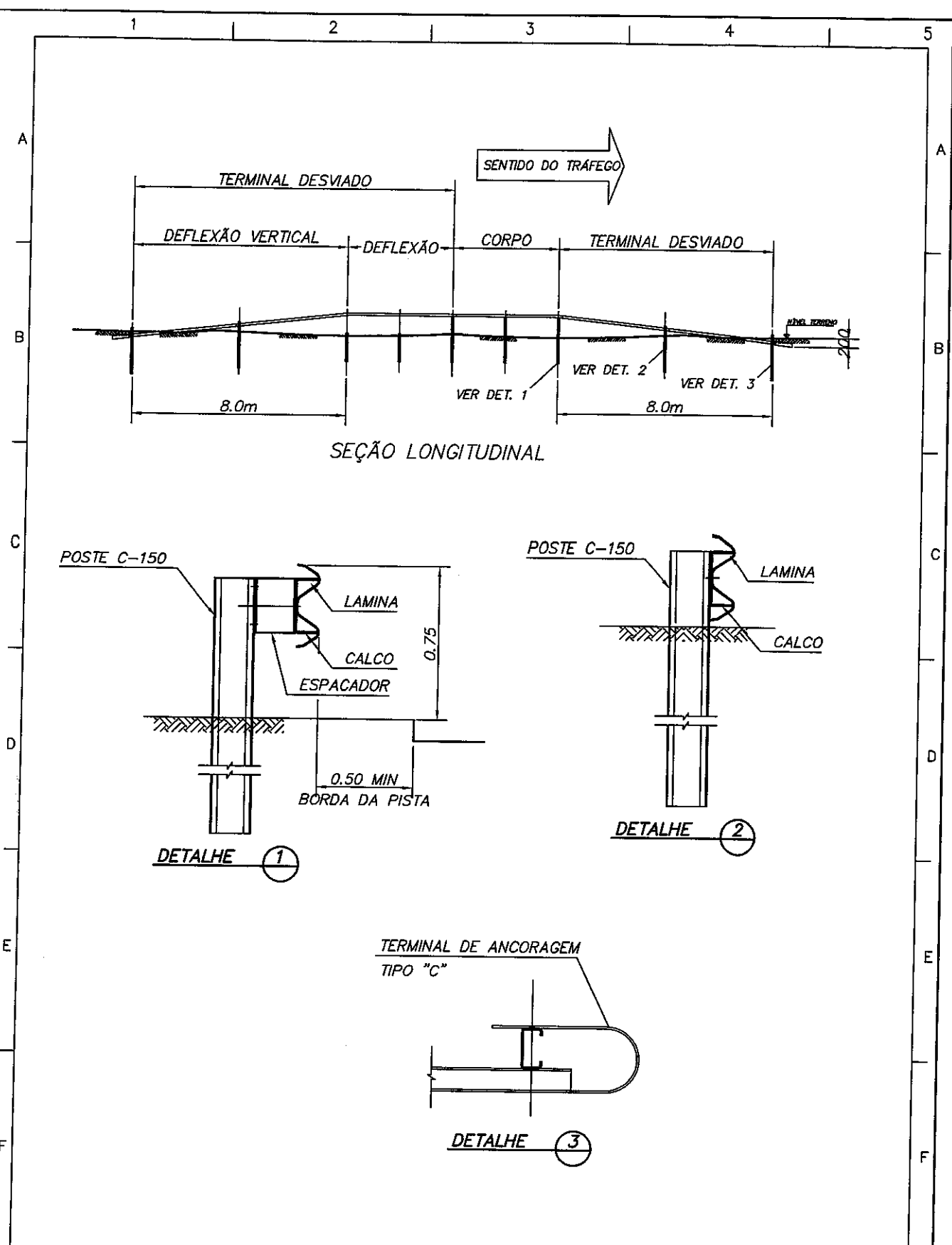


FIGURA 6-TERMINAL DESVIADO	A4	PROJEÇÃO		NOME	DATA
		DESENHO			
		PROJETO			
		VERIFICAÇÃO			
	CLIENTE	ESCALA			
		NÚMERO			FOLHA

FIGURA 6-TERMINAL DESVIADO

A4



NOME DATA

DESENHO

PROJETO

VERIFICAÇÃO

APROVAÇÃO

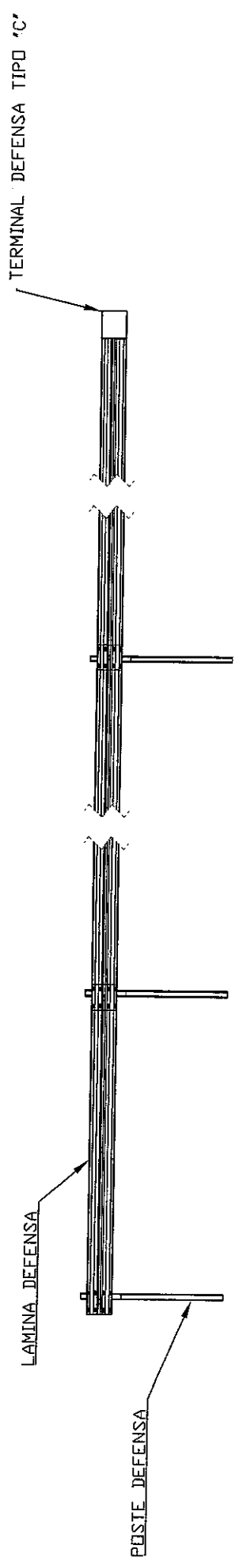
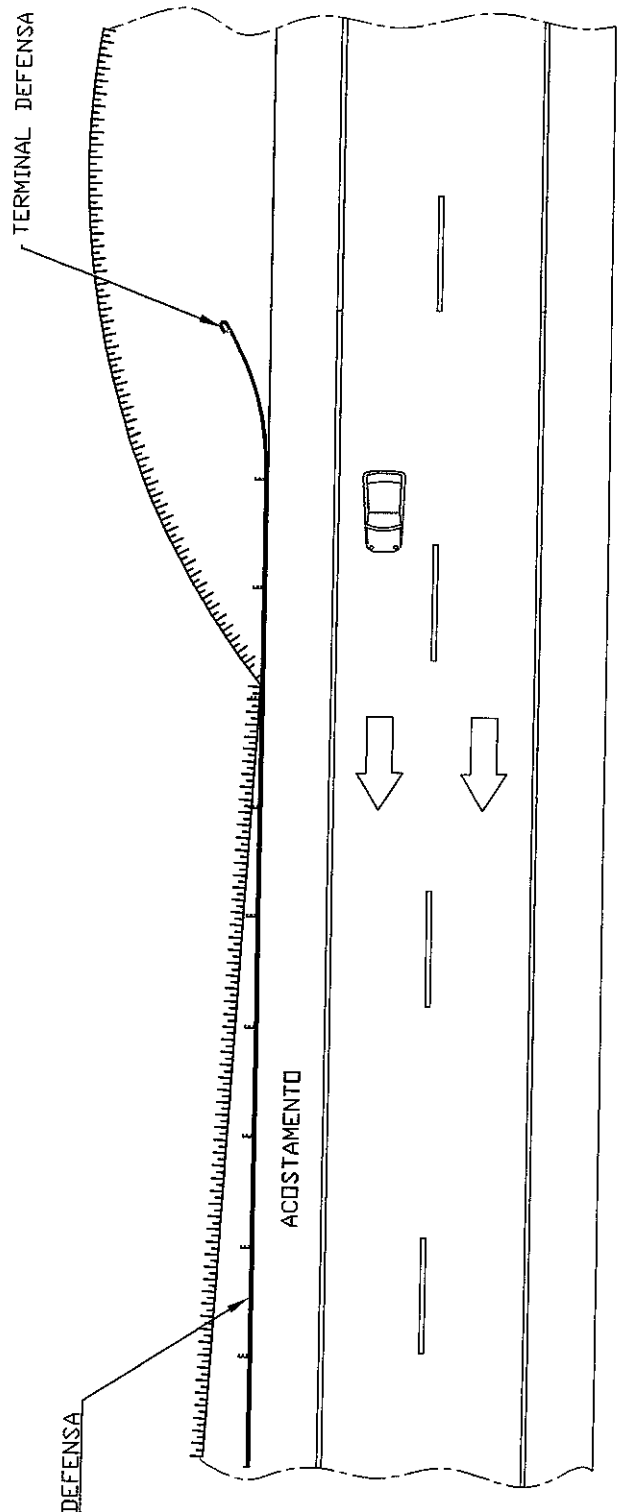
CLIENTE

ESCALA

NÚMERO

FOLHA

CÓPIAS:		DESCR. PROJ.		FORM.	
1	1	1	1	1	1
COMPRAS	ITEM	CODIGO	DESCR. PROJ.	FORM.	QTDE.



DETALHE DEFENSA

ESCALA:	DESENHADO:	DATA:	REVISADO:	DATA:	APROVADO:	DATA:	CODIGO	NÚMERO DA FOLHA
1:500	LF		1 DE 1
DIMENSÕES SEM UNIDADE ESPECIFICADA ESTÃO EM MM - COTAS SEM TOLERÂNCIA CONSIDERAR ± 1,0 MM, - COTAS COM 2 CASAS DECIMAIS ± 0,05 MM, - COTAS COM 1 CASA DECIMAL ± 0,5 MM. - ÂNGULOS ± 2° REBARBAR TODOS OS CANTOS.								
AS DIMENSÕES E QUANTIDADES NESTE DOCUMENTO SÃO DE PROPRIEDADE DA LINDSAY AMÉRICA DO SUL LTDA. E NÃO DEVEM SER REPRODUZIDAS OU USADAS PARA NENHUM PROPÓSITO SEM APROVAÇÃO ESCRITA DA MESMA.								
DATA DESCRIÇÃO DA REVISÃO ECN REV POR APROV							MATERIAL ACABAMENTO	

DESCRIÇÃO:
 FIGURA 7-ANCORAGEM EM TALUDE DE CORTE

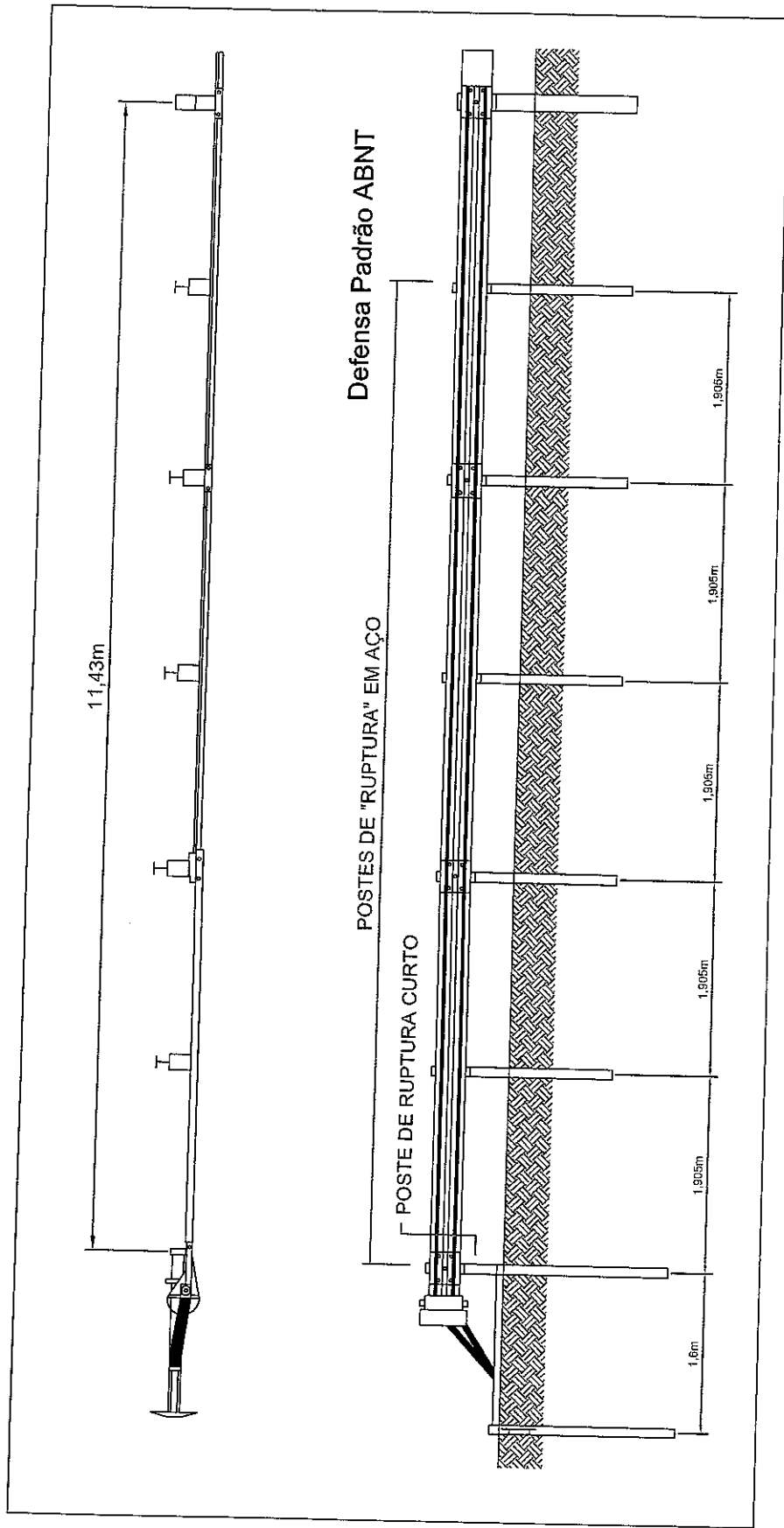
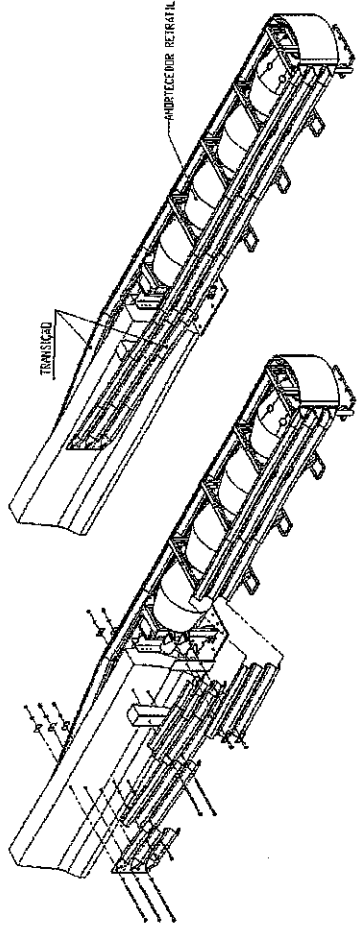


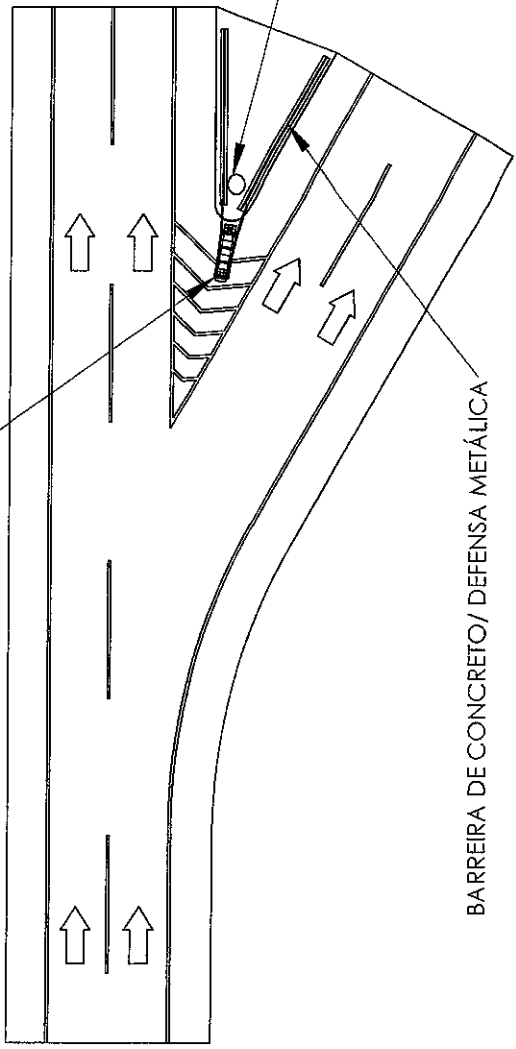
FIGURA 8 - Amortecedor Retrátil

CÓPIAS:

CC	ITEM	CÓDIGO	DESCRIÇÃO:	FORM	QTDE
COMPRAS	1				



AMORTECEDOR RETRÁTIL

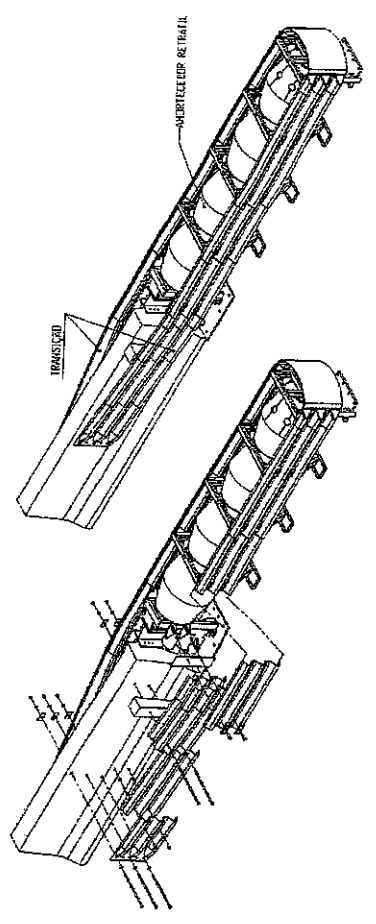


PESO LÍQ. . . Kg
 CÓDIGO GLV . . .
 PESO GLV. . . kg

ESCALA:	DESENHADO	DATA:	REVISADO	DATA:	APROVADO	DATA:	CÓDIGO	NÚMERO DA FOLHA
1:500	LF							1 DE 1
DIMENSÕES SEM UNIDADE ESPECIFICADA ESTÃO EM MM - COTAS SEM TOLERÂNCIA CONSIDERAR ± 1,0 MM. - COTAS COM 2 CASAS DECIMAIS ± 0,05 MM. - COTAS COM 1 CASA DECIMAL ± 0,5 MM. - ÂNGULOS ± 2° REBARBAR TODOS OS CANTOS.								
AS INFORMAÇÕES CONTIDAS NESTE DOCUMENTO SÃO DE PROPRIEDADE DA LINDSAY AMÉRICA DO SUL LTDA., E NÃO DEVEM SER REPRODUZIDAS OU USADAS PARA NENHUM PROPÓSITO SEM APROVAÇÃO ESCRITA DA MESMA.								
DESCRIÇÃO: FIGURA 9- OBSTÁCULO EM BIFURCAÇÃO								
MATERIAL:								
ACABAMENTO								

DATA	DESCRIÇÃO DA REVISÃO	ECH	REV	ECR	APROV

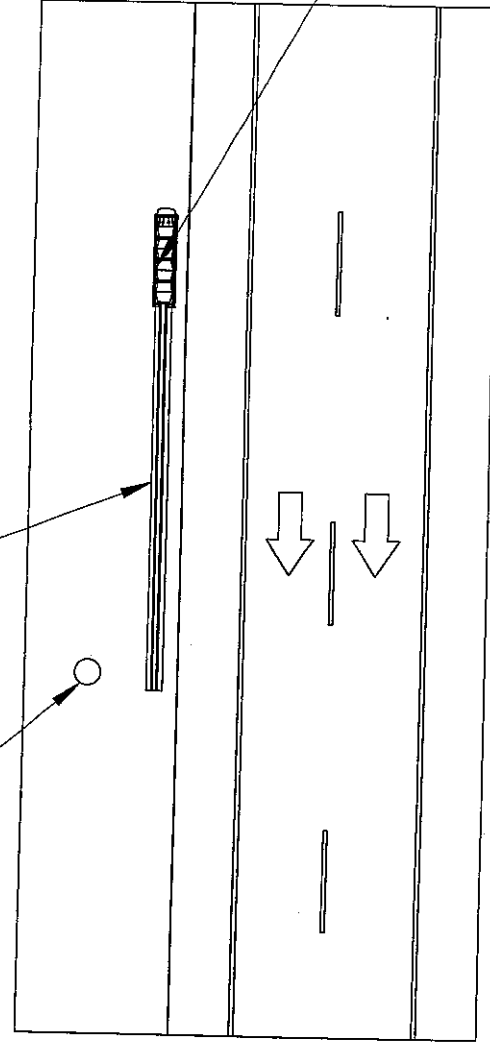
CÓPIAS:		CÓDIGO		DESCRIÇÃO:		FORM		QTDE.	
CQ	1	ITEM							
COMPRAS									



BARREIRA DE CONCRETO

OBSTÁCULO FIXO

AMORTECEDOR RETRÁTIL



PESO LÍQ. . . Kg

CÓDIGO GLV . .

PESO GLV. . . kg

ESCALA:	DESENHADO:	DATA:	REVISADO:	DATA:	APROVADO:	DATA:	CÓDIGO	NÚMERO DA FOLHA
1:500	LF							1 DE 1
DIMENSÕES SEM UNIDADE ESPECIFICADA ESTÃO EM MM - COTAS SEM TOLERÂNCIA CONSIDERAR ± 1,0 MM. - COTAS COM 2 CASAS DECIMAIS ± 0,05 MM. - COTAS COM 1 CASA DECIMAL ± 0,5 MM. - ÂNGULOS ± 2' REBARBAR TODOS OS CANTOS.								
AS INFORMAÇÕES CONTIDAS NESTE DOCUMENTO SÃO DE PROPRIEDADE DA LINDSAY AMÉRICA DO SUL LTDA E NÃO DEVEM SER REPRODUZIDAS OU USADAS PARA NENHUM PROPÓSITO SEM APROVAÇÃO ESCRITA DA MESMA.								
DESCRIÇÃO:								ACABAMENTO
FIGURA 11-BARREIRA NA LATERAL PISTA DUPLA								
MATERIAL:								

DATA	DESCRIÇÃO DA REVISÃO	ECN	REV	FOR	APROV

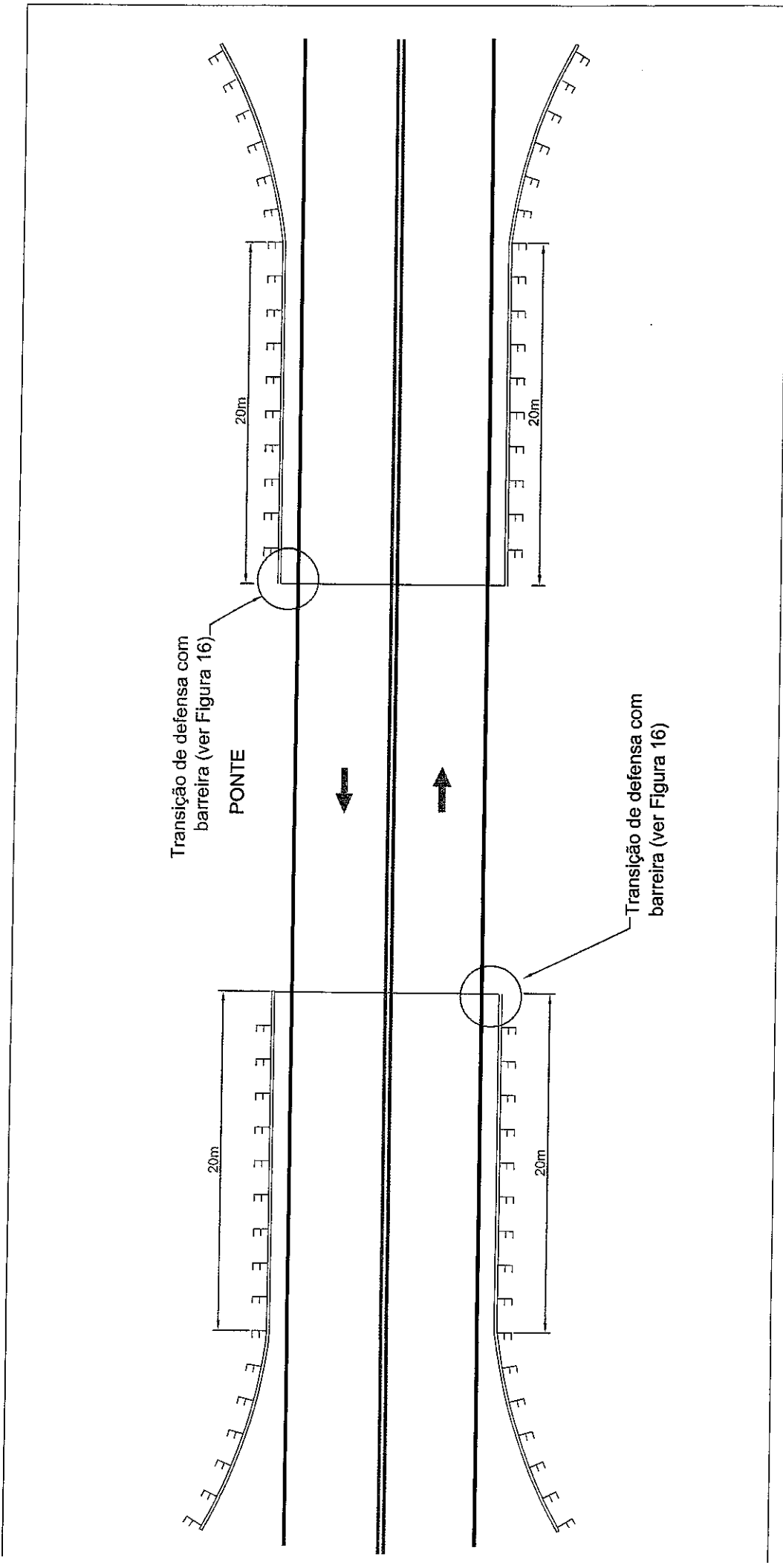


FIGURA 12 - Ponte em pista simples com terminal desviado

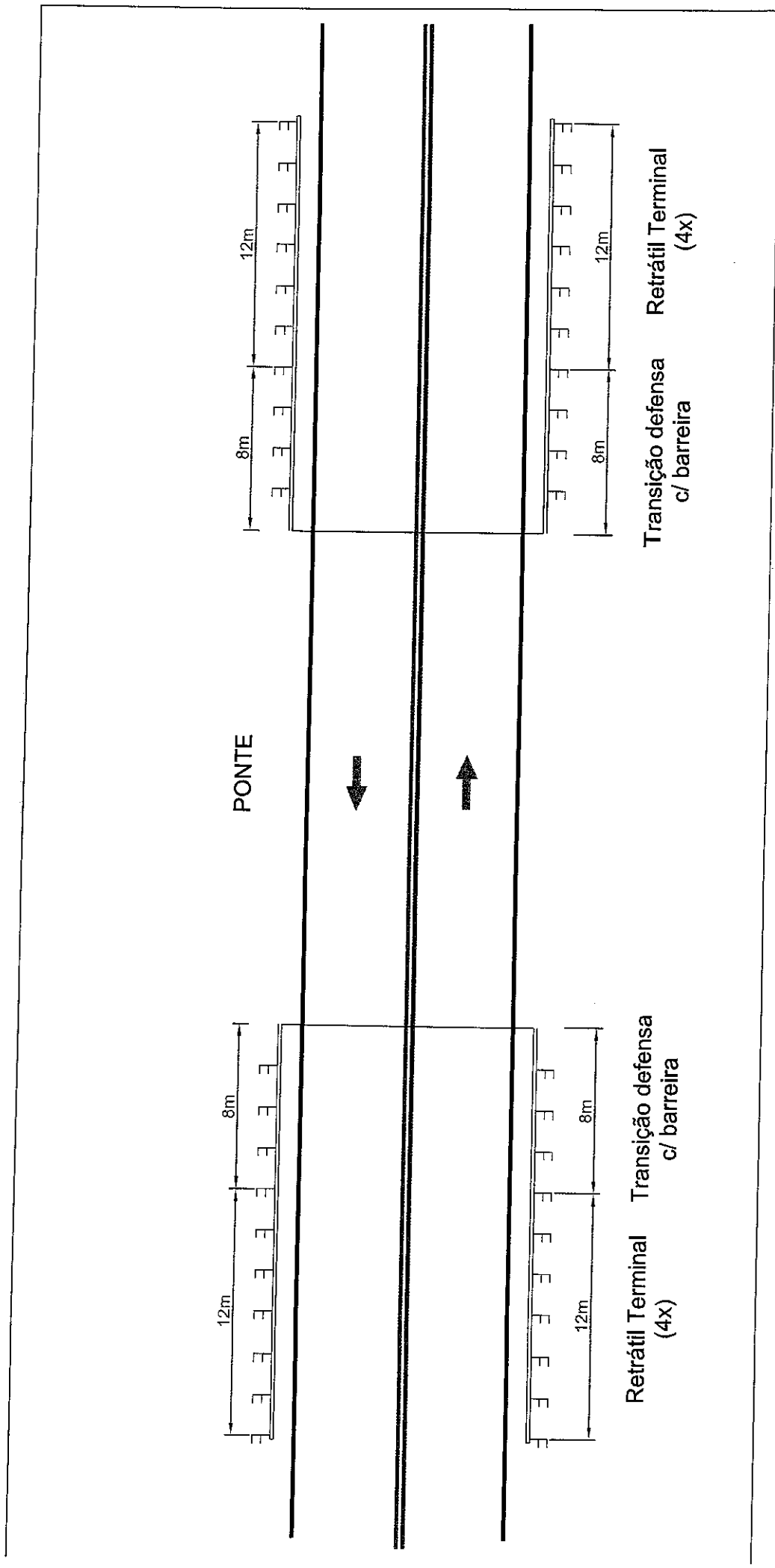


FIGURA 13 - Ponte em pista simples com terminal retrátil

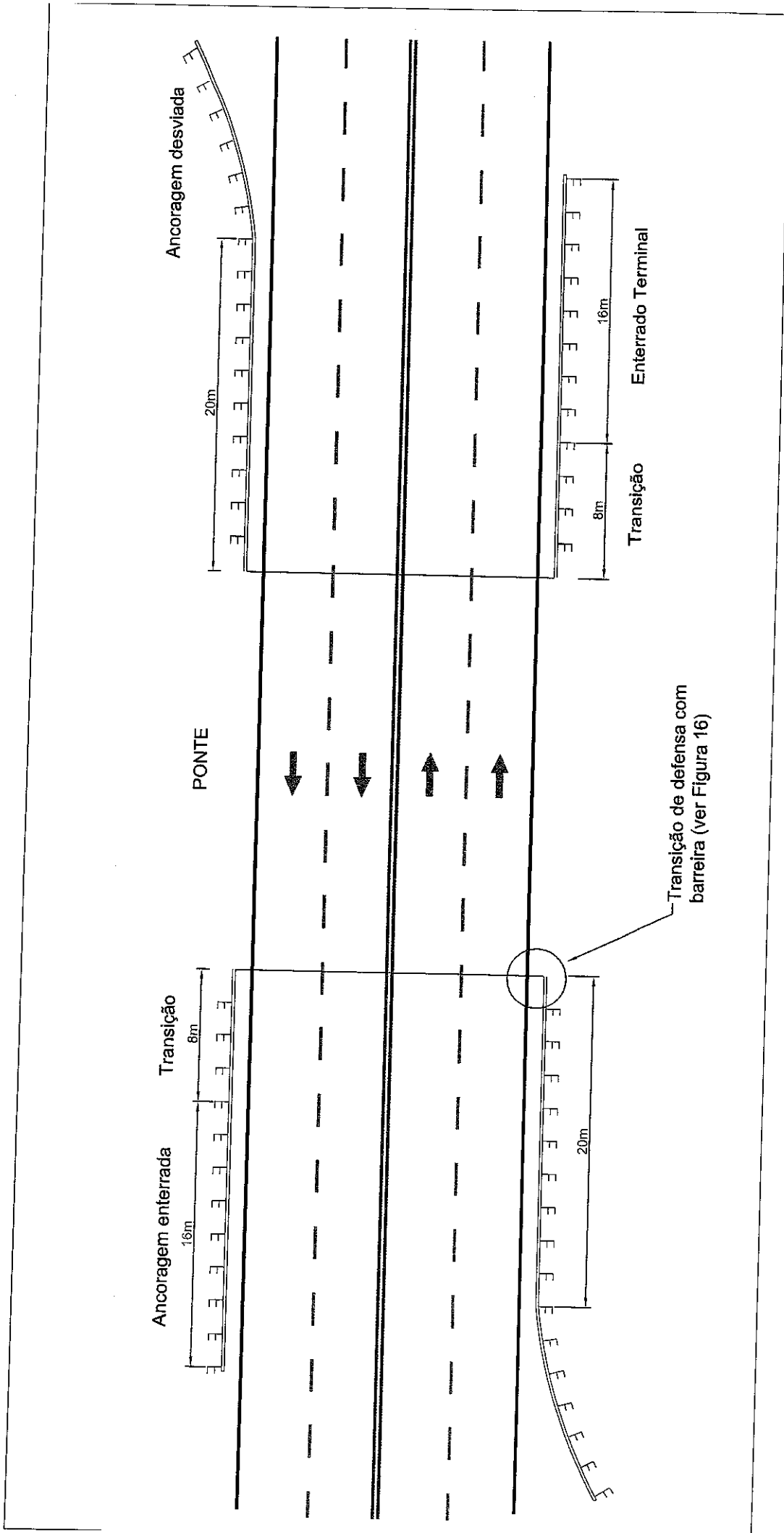


FIGURA 14 - Ponte em pista dupla com terminal desviado

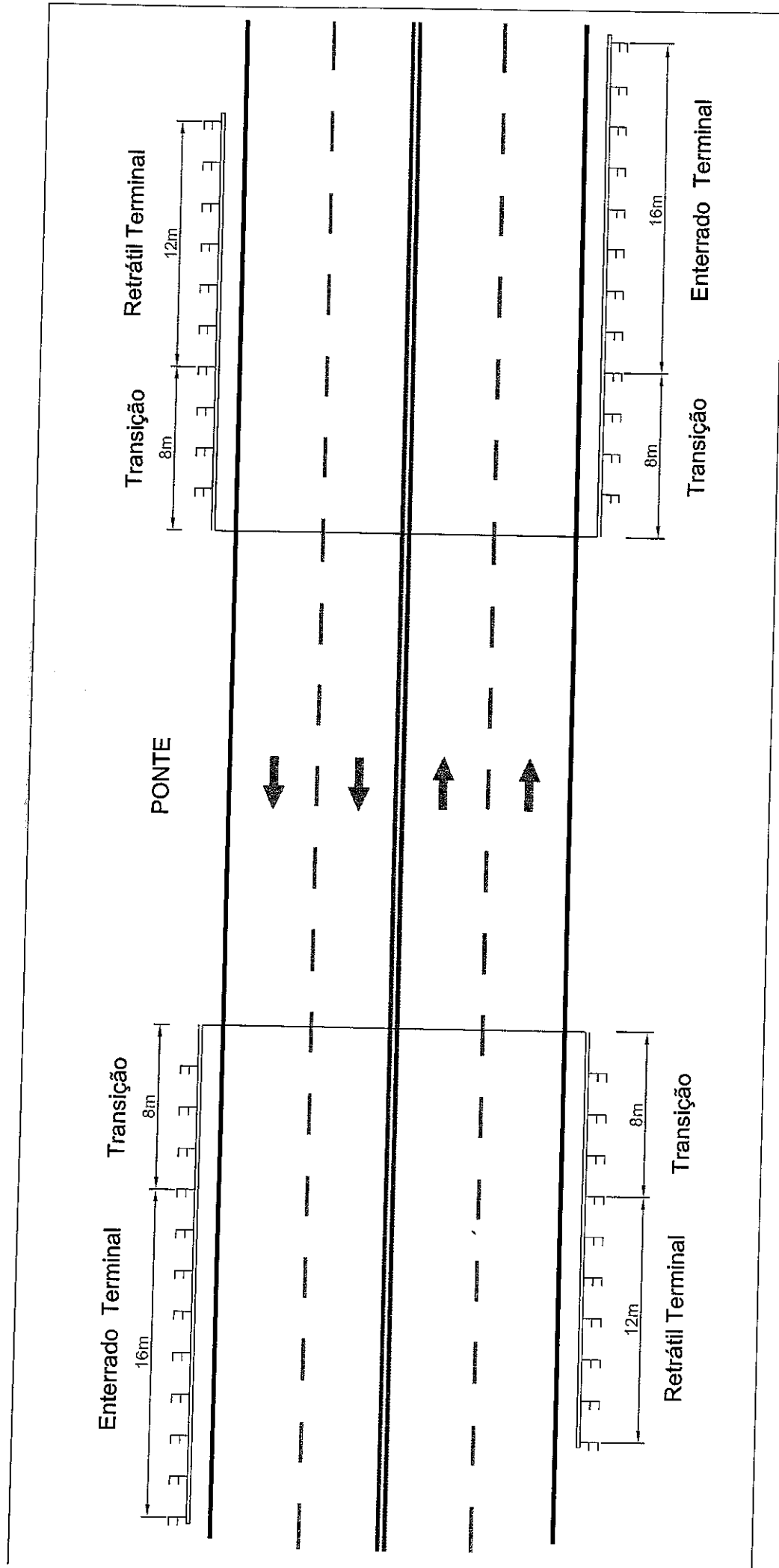
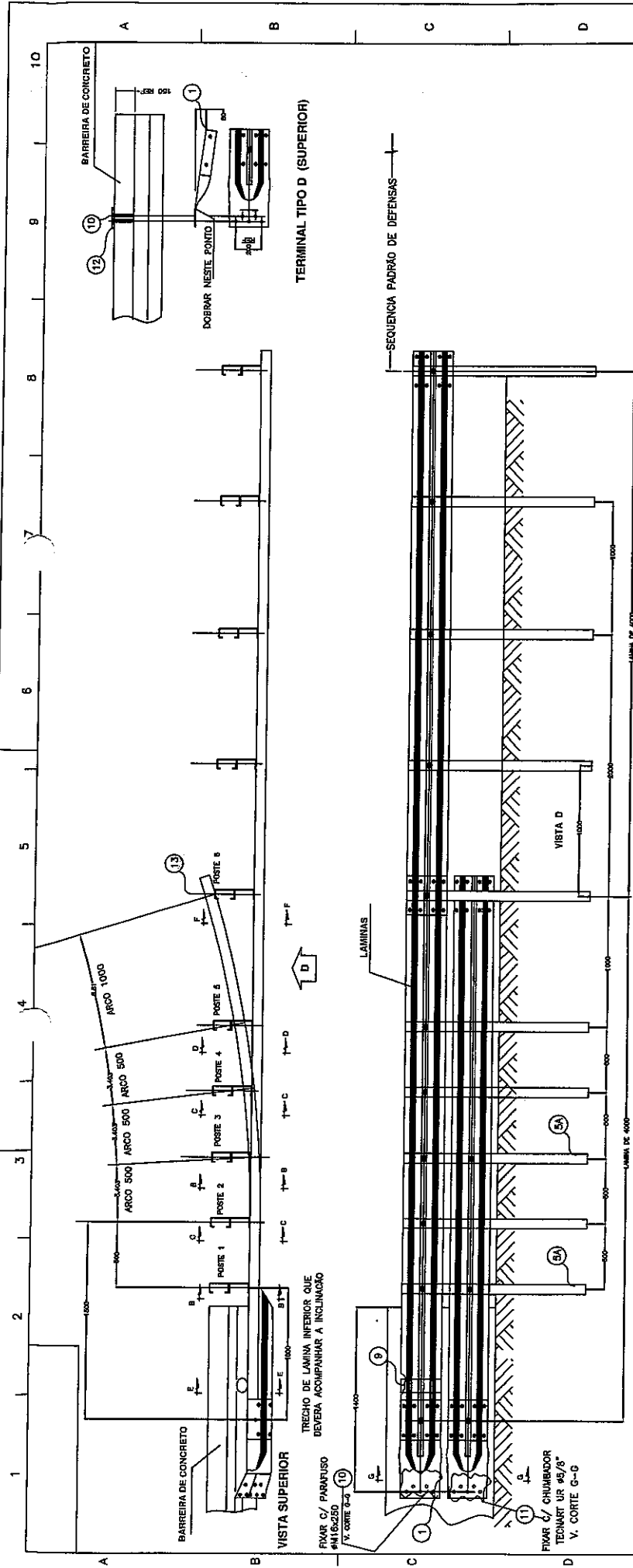


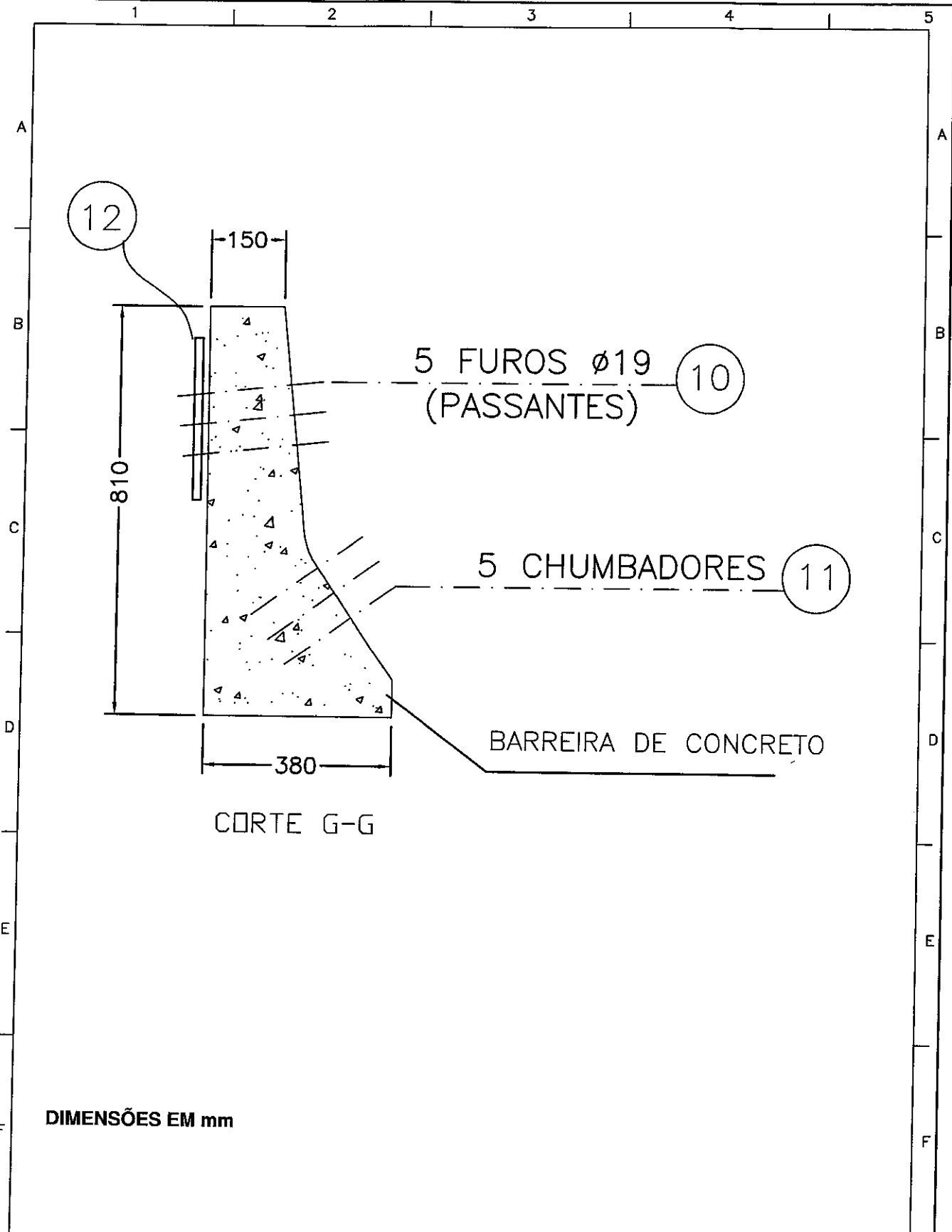
FIGURA 15 - Ponte em pista dupla com terminal retrátil



13	PARAF. CAB. SEXT. ROSCA TOTAL 5/8" x 6" COM PORCA E ARRUELA	01			
12	CHAPA DE ENCOSTO	01			
11	CONJUNTO CHUMBADOR TECNART UR 05/8"	05			COMERCIAL
10	PARAFUSO M16 x 250 COM PORCA / ARRUELA	05			
9	TUBO Ø 4" - ESPESS. 3.0mm	01			
8	PARAFUSO M16 x 50 COM PORCA / ARRUELA	14			
7	PARAFUSO M16 x 25 COM PORCA / ARRUELA	52			
6	PLAQUETA	14			
5A	POSTE C-150 C/ FURACÃO DUPLA	02			
5	POSTE C-150 C/ FURACÃO SIMPLES	08			
4	ESPACADOR SIMPLES	12			
3	CALCO	12			
2	LAMINA DE 4000mm	03			
1	TERMINAL TIPO D	02			
POS.	DESCRICO	QUANT	OBIS	NAME	DATA
			DESENHO		
			PROJETO		
			VERIFICACAO		
			APROVACAO		
			PROJECAO		
			ESCALA		
			S/E		
			NUMERO		
			FOUN		

FIGURA 16
TRANSICAO DE DEFENSA METALICA
C/ BARREIRA DE CONCRETO

NÃO USAR ESCALA SOBRE O DESENHO



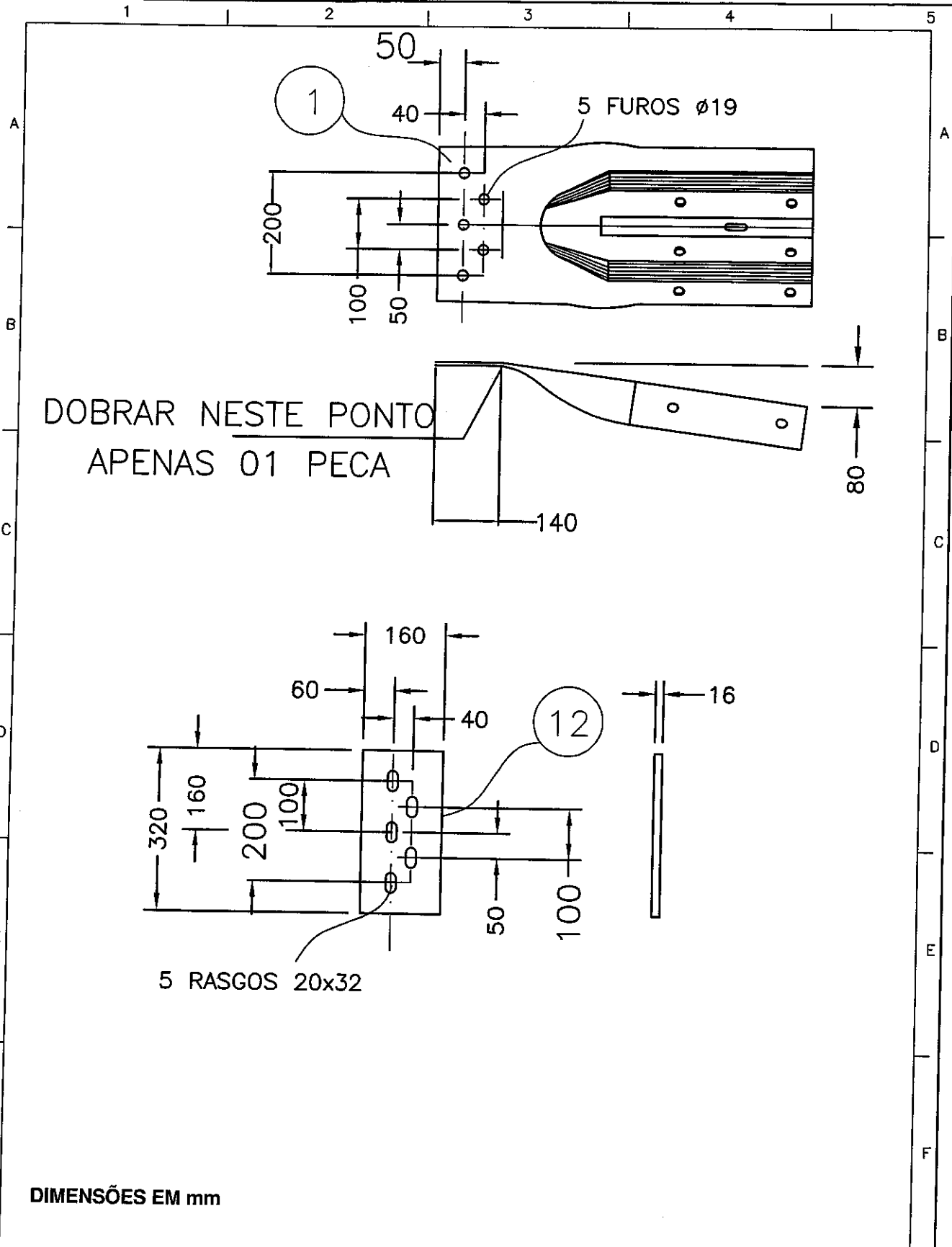
DIMENSÕES EM mm

G	TÍTULO	CLIENTE	A4	PROJEÇÃO		NOME	DATA	
			FIGURA 17- DETALHE DE FIXAÇÃO	NÚMERO	ESCALA		DESENHO	
							PROJETO	
				VERIFICAÇÃO				
				APROVAÇÃO				
						FOLHA		

FIGURA 17- DETALHE DE FIXAÇÃO

NÃO USAR ESCALA SOBRE O DESENHO

ARMCO STACO
RIO DE JANEIRO / BRASIL
TODOS OS DIREITOS RESERVADOS



DIMENSÕES EM mm

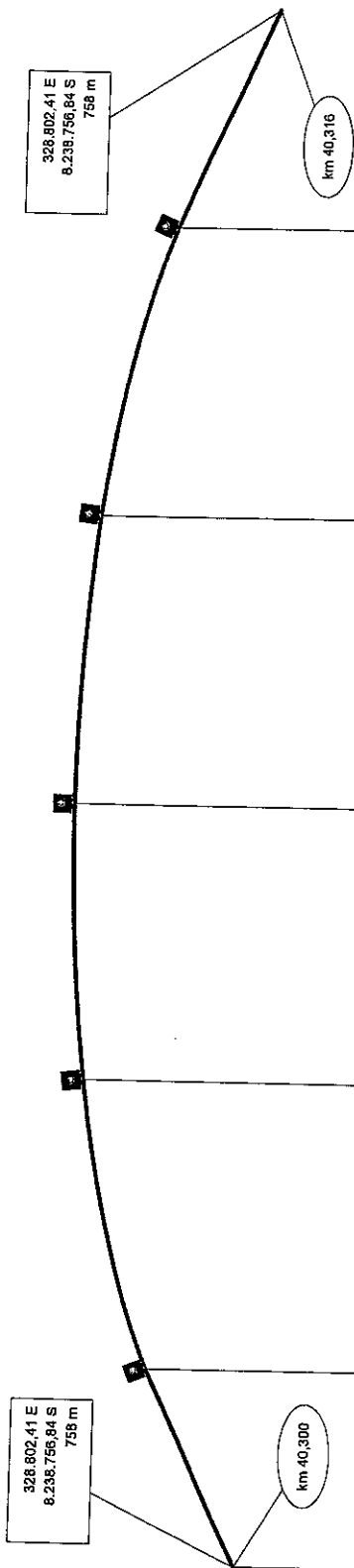
		A4	PROJEÇÃO		NOME	DATA
			ESCALA	DESENHO		
TÍTULO	CLIENTE			PROJETO		
				VERIFICAÇÃO		
FIGURA 18- DETALHE DE FIXAÇÃO		NÚMERO		APROVAÇÃO		
				FOLHA		8/12

Anexo II:

Plano de Trabalho – Modelo de Apresentação

Lâmina de defesa

Ancoragem



Lado	LE
Nº da Lâmina	01
Tipo da Lâmina	Existente
Curva (C) - Raio (R)	C
Raio de Curvatura Estimado	1.200
Condição de Conservação	Boa
Elementos de Fixação	Regular
Seção Transversal - Altura (m)	Corte - 12 m
Distância do Bordo do acostamento (m)	2,5

Volume de Tráfego Estimado (ano 2010)



Fotografia 01: detalhe do estado de conservação da defesa - ancoragem destruída



Fotografia 01: detalhe do estado de conservação da defesa - ancoragem destruída



Fotografia 01: detalhe do estado de conservação da defesa - ancoragem destruída

DNIT Programa de Defensas em Rodovias Federais - PRODEFENSAS

Diário:	Aprovado por:	REVISÕES	
Verificado por:	Assinatura DNIT:	Nº	Data
			Descrição
Rodovia/UF:			
km inicial:			
km final:			Código do PNV:
Logotipo do Contratado		Nº do Contrato	fl. xxx
		Lote:	

DESENHOS (Nº)		PRODEFENSAS - PLANO DE TRABALHO		Nº	/2010	
LOCAIS COM DEFENSAS NOVAS						
PLANILHA DE SERVIÇOS						
ITEM	CÓDIGO	DISCRIMINAÇÃO	UNID.	QUANT	P. UNIT.	P. TOTAL
1	4S 06 010 01	DEFENSA SEMI-MALEÁVEL SIMPLES (FORN. / IMPL)	m			
2	4S 06 010 02	ANCORAGEM PARA DEFENSA SEMI-MALEÁVEL SIMPLES (FORN. / IMPL)	m			
3		DEFENSAS SEMI-MALEÁVEL SIMPLES EM CURVAS (FORN. E IMPL)	m			
17		AMORTECEDOR RETRÁTIL P/ VELOC < 100 KM/H - FORN. E IMPL.	und			
18		KIT P/ AMORTECEDOR RETRÁTIL P/ VELOC < 100 KM/H - FORN. E IMPL.	und			
19		AMORTECEDOR DE IMPACTO, LARG= 0,90 M P/ VELOC ≥ 100 KM/H - FORN. E IMPL.	und			
20		KIT P/ AMORTECEDOR DE IMPACTO, LARG= 0,90 M P/ VELOC ≥ 100 KM/H - FORN. E IMPL.	und			
21		BARREIRA DE AÇO C/ 12 M SEÇÃO C/ ENCAIXE MACHO E/OU FÊMEA - FORN. E IMPL.	und			
Sub Total 1 (% do total do orçamento)					#DIV/0!	
LOCAIS COM DEFENSAS REABILITADAS						
PLANILHA DE SERVIÇOS						
ITEM	CÓDIGO	DISCRIMINAÇÃO	UNID.	QUANT	P. UNIT.	P. TOTAL
4		LIMPEZA E REALINHAMENTO DE DEFENSAS METÁLICAS	m			
5		REMOÇÃO DE DEFENSA METÁLICA	m			
6		REABILITAÇÃO DE LÂMINA DE DEFENSA METÁLICA	m			
7		COLOCAÇÃO DE LÂMINA DE DEFENSA SEMI-MALEÁVEL REABILITADA	m			
8		COLOCAÇÃO DE LÂMINA P/ ANCORAGEM DE DEFENSA SEMI-MALEÁVEL REABILITADA	m			
9		COLOCAÇÃO DE DEFENSAS SEMI-MALEÁVEL REABILITADA COM FORN. E IMPL. DE ACESSÓRIOS	m			
10		COLOCAÇÃO DE DEFENSAS SEMI-MALEÁVEL REABILITADA COM FORN. E IMPL. DE COLUNAS FLANGEADAS	m			
11		LÂMINA DE DEFENSA SEMI-MALEÁVEL - FORN. E IMPL	m			
12		CALÇO E ESPAÇADOR P/ DEFENSA METÁLICA - FORN. E IMPL.	und			
13		POSTE P/ DEFENSA METÁLICA - FORN. E IMPL.	und			
14		CHUMBADOR EM OAE OU ROCHA - FORN. E IMPL	und			
15		DISPOSITIVO REFLETIVO P/ DEFENSAS - FORN. E IMPL	und			
16		TERMINAL AÉREO P/ DEFENSA METÁLICA - FORN. E IMPL	und			
Sub Total 2 (% do total do orçamento)					#DIV/0!	
Total Orçamento (R\$)						

Anexo III:

Quadro de Execução Física



QUADRO DE EXECUÇÃO FÍSICA

CONSORCIO/EMPRESA:
CONTRATO:
LOTE:

PERÍODO:
MEDIÇÃO:
UF:
UL:

DEFENSA METÁLICA REABILITADA

Table with columns: Item, Descrição do Serviço, Unid, Quant, Pista S (simples) D (dupla), BR, km (f), Localização do Segmento (Coord. Geográfica LAT LONG ALT), km (f), Coord. Geográfica LAT LONG ALT, Tangente, Curva, Característica(s) do Segmento (OAE Ponte Outras Plano Ondulado Activo Declive Aterro Corte)

DEFENSA METÁLICA NOVA

Table with columns: Item, Descrição do Serviço, Unid, Quant, Pista S (simples) D (dupla), BR, km (f), Localização do Segmento (Coord. Geográfica LAT LONG ALT), km (f), Coord. Geográfica LAT LONG ALT, Tangente, Curva, Característica(s) do Segmento (OAE Ponte Outras Plano Ondulado Activo Declive Aterro Corte)

* Latitude (LAT) e Longitude (LONG) em graus decimais com precisão de 6 casas decimais; altura (ALT) em metros

EMPRESA

DNT

Anexo IV:

Relatório Fotográfico

Anexo V:

Diário de Obras

DNIT

DIÁRIO DE OBRAS - PRODEFENSAS

TERMO DE ABERTURA

Aos _____ dias do mês de _____ do ano de _____, na presença do _____, Engenheiro Fiscal do DNIT, _____, Engenheiro da Unidade Local do DNIT(UL), e do _____, Engenheiro Responsável da empresa contratada, foi aberto o presente livro denominado "DIÁRIO DE OBRA" nº _____, com folhas numeradas em ordem crescente de ____ a _____, onde serão registradas resumidamente e com clareza todas as ocorrências importantes bem como os comentários e observações pertinentes devidamente rubricado pelos engenheiros.

Alegaram todos os presentes terem conhecimento das Normas e Especificações vigentes do DNIT. Por estarem assim ciente e de acordo, assinaram o presente Termo de Abertura.

OBRA:

TRECHO:

SUBTRECHO:

CONTRATO:

EMPRESA:

Eng (a). Fiscal do DNIT

Eng (a). da UL

Eng. Resp. Empresa



DIÁRIO DE OBRAS

nº da folha

--	--

DATA (dd/mm/aa)

--	--	--

OBRA

SEGURANÇA VIÁRIA

CONTRATO Nº

--

EMPRESA

--

SUPERVISORA

--

TEMPO (CLIMA)

BOM	INSTÁVEL	CHUVOSO	IMPRATICÁVEL
-----	----------	---------	--------------

DIA DA SEMANA

DOM	SEG	TER	QUA	QUI	SEX	SÁB
-----	-----	-----	-----	-----	-----	-----

1 - SERVIÇO DESENVOLVIDO

IMPL. DEFENSA NOVA	IMPL. DEFENSA REABILITADA	REMOÇÃO DE DEFENSA	OUTROS

2 - EVENTOS COM RESTRIÇÕES

EQUIPAMENTO	PESSOAL	MATERIAL	QUALIDADE	ATENDIMENTO A FISCALIZAÇÃO	OUTROS

3 - COMENTÁRIOS DA SUPERVISORA

--

4 - COMENTÁRIOS DO FISCAL DO DNIT

--

5 - COMENTÁRIOS DA EMPRESA

--

RESP. PELA EMPRESA

ENG. DA SUPERVISORA

ENG. FISCAL DO DNIT

PROGRAMA CREMA

**INSTRUÇÃO DE SERVIÇO PARA A EXECUÇÃO DE
OBRAS DO CREMA 1ª ETAPA**